



## Arlington Conservation Commission

**Date:** Thursday, April 4, 2024

**Time:** 7:00 PM

**Location:** Conducted by Remote Participation.

Please register in advance for this meeting. Reference materials, instructions, and access information for this specific meeting will be available 48 hours prior to the meeting on the Commission's agenda and minutes page. This meeting will be conducted in a remote format consistent with Chapter 2 of the Acts of 2023, which further extends certain COVID-19 measures regarding remote participation in public meetings until March 31, 2025. Please note: Not all items listed may in fact be discussed and other items not listed may be brought up for discussion to the extent permitted by law. This agenda includes those matters which can be reasonably anticipated to be discussed at the meeting.

### Agenda

1. Administrative
  - a. Review Meeting Minutes
  - b. Correspondence Received. (All correspondence is available to the public. For a full list, contact the Conservation Agent at [ConComm@town.arlington.ma.us](mailto:ConComm@town.arlington.ma.us).)
2. Discussion
  - a. Eagle Scout Proposal for Arlington Great Meadows.
  - b. Water Bodies Working Group.
    - Appointment of Eileen Coleman to Water Bodies Working Group.
  - c. Tree Committee Update.
  - d. Artificial Turf Study Committee Update (next meeting TBD).
  - e. Arlington High School Permit Extension (DEP #091-0323).
  - f. 47 Spy Pond Lane Certificate of Compliance.
  - g. 19 Sheraton Park Certificate of Compliance.
3. Hearings

**Request for Determination of Applicability: 36 Peabody Road (Continuation from 3/21/2024).**

This public hearing will consider a Request for Determination of Applicability for an addition to the existing structure at 36 Peabody Road in Arlington along with landscaping and hardscaping activities within the 100-foot Buffer Zone and Adjacent Upland Resource Area to Spy Pond.

**DEP #091-0278: Amendment to Order of Conditions: 88 Coolidge Road (Continued from 3/21/2024).**

This public hearing will consider the peer review report for an amendment to an Order of Conditions for construction of a new house at 88 Coolidge Road in the Buffer Zone to a Bordering Vegetated Wetland. The Commission will vote to continue this hearing to the meeting of April 4, 2024.

**DEP #091-0356: Notice of Intent: Thorndike Place (Continuation from 3/21/2024).**

The Conservation Commission will hold a public hearing under the Wetlands Protection Act to consider a Notice of Intent for the construction of Thorndike Place, a multifamily development on Dorothy Road in Arlington.



## Town of Arlington, Massachusetts

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### Correspondence Received

#### Summary:

Correspondence Received. (All correspondence is available to the public. For a full list, contact the Conservation Agent at [ConComm@town.arlington.ma.us](mailto:ConComm@town.arlington.ma.us).)

#### ATTACHMENTS:

	Type	File Name	Description
▢	Reference Material	Thorndike_Place_-_Anna_Y.pdf	Thorndike Place - Anna Y
▢	Reference Material	Thorndike_Place_-_Anthony___Cori_Beckwith.pdf	Thorndike Place - Anthony & Cori Beckwith
▢	Reference Material	Thorndike_Place_-_Ben_Peterson.pdf	Thorndike Place - Ben Peterson
▢	Reference Material	Thorndike_Place_-_Gene_ONeill.pdf	Thorndike Place - Gene ONeill
▢	Reference Material	Thorndike_Place_-_Hatch_-_Ross_Mullen.pdf	Thorndike Place - Hatch - Ross Mullen
▢	Reference Material	Thorndike_Place_-_Janis_Fleishman.pdf	Thorndike Place - Janis Fleishman
▢	Reference Material	Thorndike_Place_-_Julia_MacKay.pdf	Thorndike Place - Julia MacKay
▢	Reference Material	Thorndike_Place_-_Madeline_Webster.pdf	Thorndike Place - Madeline Webster
▢	Reference Material	Thorndike_Place_-_Mia_Cellucci.pdf	Thorndike Place - Mia Cellucci
▢	Reference Material	Thorndike_Place_-_Pama_Miller.pdf	Thorndike Place - Pama Miller
▢	Reference Material	Thorndike_Place_-_Sally_Harris.pdf	Thorndike Place - Sally Harris

Dear Honorable Members of the Arlington Conservation Commission,

I am writing in regard to Arlington Land Realty, LLC (hereby referred to as the Developer)'s refusal to comply with the Conservation Commission's request that wells be installed/monitored by the Developer on the site of the proposed development on the Mugar Wetlands in East Arlington during the spring months when seasonal high groundwater is at its highest. This was specified in the ZBA's Order of Conditions in the Comprehensive Permit which was agreed to by the Developer. It is unacceptable that the Developer now refuses to validate their data, as accurate groundwater data is essential in determining the outcome and feasibility of this project in an area of land that is routinely subject to flooding. A lack of accurate data will be detrimental to our community in a period of unprecedented climate change. I implore you to please hold the Developer accountable in complying with this request and any other requests from the ACC, ZBA, and local authorities. This is very disappointing since the Developer has a demonstrated history of misleading data, ignoring the concerns of the community, and decades of neglect of this environmentally sensitive land parcel. Approving this project with such an uncooperative Developer could have disastrous consequences for our community for generations to come.

Thank you,  
Anna Y.  
Mott St, Arlington



## Mugar concerns

Anthony Beckwith <anthonyrbeckwith@gmail.com>

Tue 3/26/2024 3:10 PM

To: ConComm <ConComm@town.arlington.ma.us>

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Dear Commissioners:

We write to you with great concern about two issues regarding the plans for development of the Mugar Property in East Arlington::

The developer has discussed using **pesticides** in their planting/restoration process.

The developer's refusal to comply with the request to install **wells to monitor groundwater levels this spring**

We're sure you're well aware of the dangers of using glyphosates in the environment. Here is a recent study from the NIH : <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9101768/> . Living just yards from the development site, we, of course, have great concerns about the developer's plans in this regard.

As almost 30-year residents of East Arlington, living about 100 feet from the Mugar property, we have directly experienced the annual flooding problems that have plagued this and other abutting neighborhoods. Moving forward with this project without accurate data about water levels that lead to damaging flooding on a regular basis is not acceptable.

Please do whatever you can to put pressure on the developer to deal with both of these issues.

Thank You

Sincerely,

Anthony & Cori Beckwith

26 Parker St.

Arlington, MA

## Commission's request for Thorndike Place Developer

Ben Peterson <ben.forwardatlantic@gmail.com>

Thu 3/21/2024 4:41 PM

To:ConComm <ConComm@town.arlington.ma.us>

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Dear Conservation Commission,

I have attended several Arlington Conservation Commission hearings of the proposed Thorndike Place and are following this issue closely. I am a resident and homeowner in East Arlington and concerned about the risk of flooding.

The Mugar Wetlands, one of Arlington's last and largest open spaces, is essential for floodwater storage and an important wildlife habitat. I was disappointed to learn that the developer has refused to comply with the Conservation Commission's request to install/monitor wells on the site during the spring months when seasonal high groundwater is at its highest, as specified in the ZBA's Order of Conditions in the Comprehensive Permit. The Developer must be held accountable in complying with this request before the proposed Thorndike Place is considered for approval.

Thank you,  
Ben Peterson

## ConComm's impotence

gene oneillgang.com <gene@oneillgang.com>

Wed 3/27/2024 7:27 AM

To:ConComm <ConComm@town.arlington.ma.us>;Kelwyn Manor Association <kelwyn-manor@googlegroups.com>

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Dear ConComm,

As a homeowner along the shores of Spy Pond, I was thrilled to hear that the developer of the Mugar Wetlands is ignoring your request to install and monitor wells. I had been under the impression that the conservation commission has some authority. Now that I know its orders can be ignored without consequence. I am going to fast track my plans for an accessory dwelling along the edge of the pond. I look forward to following the precedent about to be set and to ignoring your future orders.

Sincerely,  
Eugene O'Neill  
18 and soon to be 18A  
Spy Pond Pkwy.

Sent from my iPhone

## RE: Thorndike Place Test Pit Summary

Mullen, Ross <ross.mullen@hatch.com>

Fri 3/22/2024 12:01 PM

To: David Morgan <dmorgan@town.arlington.ma.us>; Bitsko, Duke <duke.bitsko@hatch.com>  
Cc: Chuck Tirone <ctirone@ci.reading.ma.us>; Ryan Clapp <rclapp@town.arlington.ma.us>; Susan Chapnick <s.chapnick@comcast.net>; Mullen, Ross <ross.mullen@hatch.com>

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Hi David,

Yes, what I wrote is correct. Using soil redox to determine groundwater elevations is consistent with the practices outlined in Chapter 3, Volume 1 of Massachusetts Stormwater Handbook and Stormwater Standards.

Please note that Soil Science is its own area of expertise, unique from stormwater engineering. There are unique baccalaureate degree programs, certifications, and accreditation for soil scientists that are distinct from those certifications/accreditations/degrees fields of those engaged in stormwater management. As such, I'm unable to comment on the validity of the testing the applicant used, only to say that the stated analysis methodology, identifying seasonal high groundwater elevations using redoximorphic features, is consistent with the Massachusetts Stormwater Standards.

**Ross Mullen, PE\*, CFM\*\*** (he/his/him)

Senior Water Resources/ Hydrotechnical Engineer| Hydropower & Dams

\*Professional Engineer Licensed in AZ, ME, MN, NH, NY, ND, OR, TN, TX, and WA

\*\*Certified Floodplain Manager

**Direct Line: +1 612-395-8597**

105 South 5<sup>th</sup> Avenue Suite #350

Minneapolis, Minnesota USA 55401

# HATCH

**Vacation Alert(s):**

**-March 29 through April 7**

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**From:** David Morgan <dmorgan@town.arlington.ma.us>

**Sent:** Friday, March 22, 2024 9:14 AM

**To:** Mullen, Ross <ross.mullen@hatch.com>; Bitsko, Duke <duke.bitsko@hatch.com>

**Cc:** Chuck Tirone <ctirone@ci.reading.ma.us>; Ryan Clapp <rclapp@town.arlington.ma.us>; Susan Chapnick <s.chapnick@comcast.net>

**Subject:** Re: Thorndike Place Test Pit Summary

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Hi Ross,

8 of 142

The following question was raised at last night's Conservation Commission hearing on Thorndike Place. If you would, please reply all with your response so the commission chairs and administrator also receive your reply. I will then forward our correspondence to the full commission and the applicant.

1. In the third bullet of your 3/15/24 email to David Morgan, you say "While the applicant's groundwater readings meet the Mass Stormwater Manual, ...." Please confirm, Yes or No, whether its your professional opinion that the applicant determined Estimated Seasonal Groundwater in accordance with the MassDEP Stormwater Standards and Handbook.

Cheers,

David

David Morgan | Environmental Planner + Conservation Agent | Department of Planning and Community Development | 781.316.3012

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**From:** Mullen, Ross <[ross.mullen@hatch.com](mailto:ross.mullen@hatch.com)>

**Sent:** Friday, March 15, 2024 10:43 AM

**To:** David Morgan <[dmorgan@town.arlington.ma.us](mailto:dmorgan@town.arlington.ma.us)>; Ryan Clapp <[rclapp@town.arlington.ma.us](mailto:rclapp@town.arlington.ma.us)>; Bitsko, Duke <[duke.bitsko@hatch.com](mailto:duke.bitsko@hatch.com)>

**Cc:** ConComm <[ConComm@town.arlington.ma.us](mailto:ConComm@town.arlington.ma.us)>; Mullen, Ross <[ross.mullen@hatch.com](mailto:ross.mullen@hatch.com)>

**Subject:** RE: Thorndike Place Test Pit Summary

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David,

At this time, Hatch's recommendation is for "**Recommended Site Modification**" and "**Collection of Additional Data**" based both on the criteria listed in the Mass Stormwater Manual and our professional judgement.

In summary, there is considerable uncertainty in the soils at the site, and even by the applicant's own admission, they barely meet multiple standards regarding separation from groundwater. Regarding the separation from groundwater, the margin for error on this site is extremely small. The separation from groundwater will affect the proposed project's ability to conform with the standards 2, 3, and 4 :

- o In our experience, infiltration BMP's near wetlands and infiltration in areas of historic fill are very atypical, because many engineers do not feel confident that the types of soils commonly found at these locations will be able to infiltrate stormwater runoff in the long-term. This site is both proximal to a wetland and located on historic fill.
- o The design does not meet the minimum permissible setbacks to structures for infiltration devices may be found in Table RR of the Mass Stormwater Manual.
- o Hatch remains very concerned that there is appreciable groundwater-intrusion based flood risk to the townhomes and we are concerned that insufficient separation to groundwater would result in the project not meeting the required water quality criteria. While the applicant's groundwater

readings meet the Mass Stormwater Manual, there are numerous engineering best practice guides and that state that wet floodproofing should be secondary to good engineering design that keeps water away from building foundations (e.g. FEMA NFIP Technical Bulletin 10 dated March 2023). There is both a risk of hydrostatic pressure induced collapse of the foundations, as well as basement damage from groundwater intrusion to the structures. Based on these principles, the Town of Arlington bylaws include a requirement of 4.0-feet of separation between the low floor of occupied levels and the seasonal high-water table [Section 5.8.6.A(2)], which we understand is not subject to the review of the Conservation Commission.

- Because we understood the stormwater peer review was closed, we have not yet reviewed the groundwater mounding analysis.
- We concur with the recommendations of the Conservation Commissioners that was expressed at the February 15, 2024 meeting, which included the recommendations to collect additional groundwater levels at the site. We believe that the additional data collection would either help to validate or repudiate the established groundwater elevations and provide significantly more certainty.

**Ross Mullen, PE\*, CFM\*\*** (he/his/him)

Senior Water Resources/ Hydrotechnical Engineer| Hydropower & Dams

\*Professional Engineer Licensed in AZ, ME, MN, NH, NY, ND, OR, TN, TX, and WA

\*\*Certified Floodplain Manager

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105 South 5<sup>th</sup> Avenue Suite #350

Minneapolis, Minnesota USA 55401

# HATCH

**Vacation Alert(s):**

**-March 29 through April 7**

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**From:** David Morgan <[dmorgan@town.arlington.ma.us](mailto:dmorgan@town.arlington.ma.us)>

**Sent:** Friday, March 15, 2024 9:11 AM

**To:** Mullen, Ross <[ross.mullen@hatch.com](mailto:ross.mullen@hatch.com)>; Ryan Clapp <[rclapp@town.arlington.ma.us](mailto:rclapp@town.arlington.ma.us)>; Bitsko, Duke <[duke.bitsko@hatch.com](mailto:duke.bitsko@hatch.com)>

**Cc:** ConComm <[ConComm@town.arlington.ma.us](mailto:ConComm@town.arlington.ma.us)>

**Subject:** Re: Thorndike Place Test Pit Summary

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Thanks, Ross. Having spoken with the commission chairs about the review, I understand your request for a change order. I expect the commissioners will discuss at Thursday's hearing whether they feel they have sufficient information to move forward, or if they want to request a change order.

Does Hatch have a recommendation based on the information reviewed to date? There was language in the contract about Hatch providing recommendations "for approval, conditional approval, recommended site modification, or denial of the proposed development." Which of these categories do your findings fit best?

Cheers,

David

David Morgan | Environmental Planner + Conservation Agent | Department of Planning and Community Development | 781.316.3012

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**From:** Mullen, Ross <[ross.mullen@hatch.com](mailto:ross.mullen@hatch.com)>

**Sent:** Thursday, March 14, 2024 2:02 PM

**To:** David Morgan <[dmorgan@town.arlington.ma.us](mailto:dmorgan@town.arlington.ma.us)>; Ryan Clapp <[rclapp@town.arlington.ma.us](mailto:rclapp@town.arlington.ma.us)>; Bitsko, Duke <[duke.bitsko@hatch.com](mailto:duke.bitsko@hatch.com)>

**Cc:** ConComm <[ConComm@town.arlington.ma.us](mailto:ConComm@town.arlington.ma.us)>; Mullen, Ross <[ross.mullen@hatch.com](mailto:ross.mullen@hatch.com)>; Mullen, Ross <[ross.mullen@hatch.com](mailto:ross.mullen@hatch.com)>

**Subject:** RE: Thorndike Place Test Pit Summary

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Welcome back David.

My apologies, it was my understanding that the Conservation Commission had moved onto the habitat review and were no longer receiving comments from the stormwater peer reviewer.

Additionally, the Hatch team is happy to continue to provide comments and attend Conservation Commission public meetings; however, we will require a change order as our scope only included attendance of one public meeting by two staff (or two meetings by one staff member) and one set of response to comments from the applicant. Unfortunately, we've exhausted our original budget by attending multiple meetings and issuing several rounds of comments.

Let us know how you'd like to proceed.

**Ross Mullen, PE\*, CFM\*\*** (he/his/him)

Senior Water Resources/ Hydrotechnical Engineer| Hydropower & Dams

\*Professional Engineer Licensed in AZ, ME, MN, NH, NY, ND, OR, TN, TX, and WA

\*\*Certified Floodplain Manager

**Direct Line: +1 612-395-8597**

105 South 5<sup>th</sup> Avenue Suite #350

Minneapolis, Minnesota USA 55401

**HATCH**

**Vacation Alert(s):**  
**-March 29 through April 7**

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**From:** David Morgan <[dmorgan@town.arlington.ma.us](mailto:dmorgan@town.arlington.ma.us)>  
**Sent:** Thursday, March 14, 2024 12:22 PM  
**To:** Dominic R. Rinaldi <[drinaldi@bscgroup.com](mailto:drinaldi@bscgroup.com)>; Ryan Clapp <[rclapp@town.arlington.ma.us](mailto:rclapp@town.arlington.ma.us)>; Stephanie Kiefer <[SKiefer@smolakvaughan.com](mailto:SKiefer@smolakvaughan.com)>; Bitsko, Duke <[duke.bitsko@hatch.com](mailto:duke.bitsko@hatch.com)>; Mullen, Ross <[ross.mullen@hatch.com](mailto:ross.mullen@hatch.com)>  
**Cc:** ConComm <[ConComm@town.arlington.ma.us](mailto:ConComm@town.arlington.ma.us)>  
**Subject:** Re: Thorndike Place Test Pit Summary

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Hi Duke and Ross,  
Are you in receipt of Dom's report and will you be able to provide feedback on the submitted supplemental materials by COB?

While we received BSC's materials by the deadline for the next meeting, we won't have a response, so in order to facilitate discussion, the sooner the better.

Cheers,

David

David Morgan | Environmental Planner + Conservation Agent | Department of Planning and Community Development | 781.316.3012

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**From:** Dominic R. Rinaldi <[drinaldi@bscgroup.com](mailto:drinaldi@bscgroup.com)>  
**Sent:** Wednesday, March 13, 2024 12:06 PM  
**To:** Ryan Clapp <[rclapp@town.arlington.ma.us](mailto:rclapp@town.arlington.ma.us)>; Stephanie Kiefer <[SKiefer@smolakvaughan.com](mailto:SKiefer@smolakvaughan.com)>; Bitsko, Duke <[duke.bitsko@hatch.com](mailto:duke.bitsko@hatch.com)>; Mullen, Ross <[ross.mullen@hatch.com](mailto:ross.mullen@hatch.com)>  
**Cc:** ConComm <[ConComm@town.arlington.ma.us](mailto:ConComm@town.arlington.ma.us)>  
**Subject:** Thorndike Place Test Pit Summary

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All,  
Please find the attached Test Pit Summary Report for Thorndike Place submitted to clarify information previously provided. Please confirm receipt and let me know if you have any questions. Thank you.

**Dominic Rinaldi, PE** (he, him)

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Engineering Manager, Senior Associate

O: 617-896-4300 / D: 617-896-4386

[drinaldi@bscgroup.com](mailto:drinaldi@bscgroup.com)

[www.bscgroup.com](http://www.bscgroup.com)

## Mugar Wetlands CONCERN: Developer must install/monitor wells

Janis Fleishman <jfleishm@gmail.com>

Tue 3/26/2024 9:09 AM

To: ConComm <ConComm@town.arlington.ma.us>; Janis Fleishman <jfleishm@gmail.com>

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Good Day:

I have major concerns regarding the proposed development in the Mugar Wetlands.

In East Arlington the **flooding** is already a major problem and is increasing with each rain event. I live at 80 Margaret St. which abuts the bike path. There is now a "pond" of standing water in my neighbor's backyard. We've had 3 basement floods in the past 2 months. My entire backyard is mushy with water. We have RAW SEWAGE coming up into the sump pump pit.

**The Developer must comply with the request to install/monitor wells at the appropriate location. And they must provide assurances flood mitigation will be part of the plan. OTHERWISE, it's a NO GO.**

Janis Fleishman

## Mugar Wetlands - Serious concerns about Thorndike Place

Julia Carlton MacKay <julia.a.carlton@gmail.com>

Wed 3/27/2024 11:54 AM

To: ConComm <ConComm@town.arlington.ma.us>

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To the Arlington Conservation Commission,

I am deeply saddened by the Conservation Commission's lack of action as the project proponent fails to comply with the request to install/monitor wells at the appropriate project site location.

As a whole, the project is environmentally unsound. Adding additional impermeable surfaces to wetlands and floodplains in an area that floods and is proximate to existing housing is a terrible idea, and sure to exacerbate a challenge that will already increase due to our changing climate and weather patterns. We are already seeing heavier rainfalls in shorter timeframes than even a decade ago, and stormwater flooding is already a major issue in this area. Our wetlands and floodplains/floodways are only growing in importance. Additionally, the increased car traffic will exacerbate the existing congestion on local roads and arterials. The proponent's claims that this project is an example of Smart Growth and transit-oriented development is inaccurate. While proximate to the Alewife T Station, it is NOT proximate to other required neighborhood amenities including grocery stores, or other transit options that are important connectors in our region. Future residents of this development would need cars in order to accomplish most tasks related to daily living.

Thank you,  
Julia Carlton MacKay  
Arlington resident

## E Arlington Resident - Development of the Mugar Wetlands

M Webster <maddywebster@hotmail.com>

Sun 3/24/2024 3:33 PM

To: ConComm <ConComm@town.arlington.ma.us>

Cc: clarissa.rowe@comcast.net <clarissa.rowe@comcast.net>; epz@ethanzimmer.net <epz@ethanzimmer.net>; akatlas@gmail.com <akatlas@gmail.com>; bncboston@gmail.com <bncboston@gmail.com>; michele.j.phelen@gmail.com <michele.j.phelen@gmail.com>; carolynfs@gmail.com <carolynfs@gmail.com>; madeleine.delpha@gmail.com <madeleine.delpha@gmail.com>; nkaba.tmm@gmail.com <nkaba.tmm@gmail.com>; kleary@gmail.com <kleary@gmail.com>; alhams999@gmail.com <alhams999@gmail.com>

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Dear Conservation Commission,

I am writing to oppose the development of the Mugar Wetlands. I own a condo in East Arlington and here are my reasons.

My husband and I bought our condo in East Arlington (96 Melrose St) in 2006. The seller had some oriental throw carpets on the basement floor. We didn't think about flooding and the proximity to the nearby marshlands. Within the first few years of living here there were 2 "100 year" rain storms. Our sump pump worked for days sometimes emptying 5 gals of water 3 or 4 times a minute for hours. We are lucky to only have pooling water come up through the concrete floor rather than flooding. There were people on Brooks Ave a half block away canoeing in the street with many feet of water in their basements.

Currently when there are heavy rains (4 or 5 times in the last few months) our sump pump runs and we have pooling water in the basement. The water table is not far below our basement floor. We walk our dog twice a day in the neighborhood so we see how many people are struggling with flooding basements. A month or so ago I saw a house on the corner of Brooks Ave. and Varnum with water gushing above ground from the basement. This was not a sump pump - it was a high water table.

I have been following the proposed development of the Mugar Wetlands for a few years since I attended a Select Board meeting where the developers wanted approval but had not submitted any plans. The Select Board unanimously did not approve. I have been a member of the Coalition to Save the Mugar Wetlands as a way to stay informed and to prevent a development which would make East Arlington flooding problems worse and negatively impact the wetlands and floodplain of the Alewife Reservation as a buffer for future storms (not to mention climate change).

I look to the Conservation Commission to do the right and smart thing to preserve, protect, and manage Arlington's wetlands and floodplains to serve their purpose for the future.

Thank you for your consideration

Madeline Webster

96 Melrose St, East Arlington, MA 02474

781-571-1219

ps - I'm an ordinary (often discouraged) citizen but it is of great concern to me that the amount of housing continually going up in Cambridge at Alewife and along Rte 2 adjacent to the wetlands and floodplain is astounding. I wonder if this has a well thought out master plan or is just rampant development. And now the Mugar property in Arlington which is actually mostly in the wetland. A

Belmont citizen said at the Select Board meeting to those of us who attended that they fought for 10 yrs to stop their development and lost.

The Mugar developmnt combines with another issue I follow that has eluded fixing for many years - the 5 CSO's that dump raw sewage into the Alewife Brook and the need for dredging the brook which has progressively more noxious sediments. It seems that small citizen groups have to organize and fight to stop or fix these things but it is a David and Goliath battle with not so good results.

## Thorndike Place Developer must comply with the Commission's request

Mia Cellucci <miacell@gmail.com>

Wed 3/20/2024 7:09 PM

To: ConComm <ConComm@town.arlington.ma.us>

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Dear Conservation Commission,

I am a resident and homeowner on Melrose Street in East Arlington. My husband and I have attended several Arlington Conservation Commission hearings of the proposed Thorndike Place and are following this issue closely.

We were very disappointed to learn that the developer has refused to comply with the Conservation Commission's request to install/monitor **wells on the site during the spring months when seasonal high groundwater is at its highest, as specified in the ZBA's Order of Conditions in the Comprehensive Permit. We feel strongly that the Developer must be held accountable in complying with this request *before* the proposed Thorndike Place be considered for approval.**

The Mugar Wetlands, one of Arlington's last and largest open spaces, is essential for floodwater storage and an important wildlife habitat.

Thank you for your time and attention,

Mia Cellucci

64 Melrose St. Arlington MA 02474

## Conservation Commission 3/21/24 Mtg - Thorndike Place

Pama Miller <frpack@gmail.com>

Tue 3/19/2024 4:56 PM

To: ConComm <ConComm@town.arlington.ma.us>

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Dear Conservation Commission,

This message is in reference to the recent decision by the Thorndike Place developer (Developer) to disregard the Commission's request to install and monitor groundwater wells. The Commission's request reasonably addresses legitimate questions about the validity of the Developer's groundwater data.

Please consider this an abutter's support for the Commission to continue to hold the Developer accountable and ensure compliance with required groundwater monitoring. In addition, to ensure that the Developer unconditionally abides by the terms outlined in the ZBA Order of Conditions in the Comprehensive Permit.

The Developer's repeated attempts to undermine and question the integrity of Town and State approval processes is offensive. Their limited responses to environmental requirements, lack of attention to property maintenance, and disregard for neighborhood concerns does not bode well for the future of the site. In addition, the proposal is threatening the environmental integrity of not only the seventeen Arlington acres but the entire Mystic River Watershed.

Thank you to the Conservation Commission, Select Board, State Representatives, and others for your diligence and attention.

Sincerely

Pama Miller  
43 Burch St, Arlington

from my Mac

Thorndike Olace

Sally Harris <sharris3299@comcast.net>

Wed 3/20/2024 9:50 PM

To:ConComm <ConComm@town.arlington.ma.us>

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Dear Conservation Commission,

We wish to convey our concerns surrounding the blatant refusal of Arlington Land Realty LLC to install and monitor ground wells on the proposed development site in East Arlington, known as the Mugar Wetlands. Accurate documentation of exactly how high the water table rises to during the wet months of spring is essential to the integrity of the neighboring homes and playing fields. It is appalling that the developers continue to try to bully their way through the permit process.

If accurate data is obtained, we are certain that the water table would be deemed too high to allow this construction. We live 2 streets away from the area, yet when both our sump pumps rusted and seized during the heavy rainfall just this past January, we had 2 inches of water in our basement. We believe this speaks to the severe negative flood impact that the development of Thorndike Place would have on the residents who live on Dorothy, Edith, and Mott Streets.

We emlore the Conservation Commission to force the developers to install and monitor the aforementioned ground wells.

Sincerely,

Sarah Harris & Florence Murphy  
83 Mary St.  
Arlington MA 02474

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Sincerely,

Sarah Harris & Florence Murphy  
83 Mary St.  
Arlington MA 02474





## Town of Arlington, Massachusetts

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### Arlington High School Permit Extension (DEP #091-0323)

#### Summary:

Arlington High School Permit Extension (DEP #091-0323).

#### ATTACHMENTS:

	Type	File Name	Description
▢	Reference Material	Arlington_High_School_-_Memo.pdf	Arlington High School - Memo

**To: Arlington Conservation Commission**  
**From: Arlington High School Building Committee (AHSBC)**  
**Re: Extension of Order of Conditions**  
**Date: March 20, 2024**

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## **Executive Summary**

The Arlington High School Building Committee (AHSBC) has partnered with the community to create an environmentally friendly school and has a shared interest in protecting Mill Brook, which runs underneath the AHS site. This memo outlines steps the AHSBC has taken to address requests made by the Conservation Commission to provide additional protection to the brook.

The Conservation Commission voted to grant a one-year extension of an Order of Conditions for synthetic turf fields at the new Arlington High School on August 3, 2023. Following the vote, as requested by the Conservation Commission, the AHSBC evaluated alternative organic turf infills, discussed using available project contingency funds, studied safety and usage patterns of alternatives, reevaluated the infill originally selected<sup>1</sup>, and reviewed research about tire substances that may harm aquatic life. After evaluating the concerns raised by the Conservation Commission, the AHSBC design team has improved the design of the drainage system to further reduce potential particulate runoff.

After thorough evaluation of turf infill alternatives, the AHSBC found no sufficiently tested and acceptable organic turf infill, nor sufficient funds to cover any increased costs associated with these alternatives. Additionally, AHSBC and its consultants investigated the Conservation Commission's concerns about potential fish toxicity from crumb rubber, concluding that there were significant differences between road-generated tire abrade and turf infill in generating environmental toxins, and that the design of the fields and the upgraded drainage system should mitigate these concerns.

As a result, the AHSBC reiterates and restates its desire to purchase and install crumb rubber infill for the new high school fields, as approved by the Order of Conditions granted by the Conservation Commission in 2020, and respectfully requests the Commission to extend the Order as permitted by the Arlington Regulations for Wetland Protection.

To remain on schedule and on budget, the project design team must order the turf infill no later than June 30, 2024. This memo provides information to support the AHSBC's request for an extension to August of 2026 of the Order of Conditions, which impacts work taking place on 174,000 square feet of field space at the new high school, an area that will be used by all AHS students and by students playing on visiting teams.

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<sup>1</sup> Since the AHSBC began work in 2016, it has reviewed multiple reports and studies on the impact of crumb rubber infill on the environment, Mill Brook, and on the health of students and staff who use the fields. Primary sources of reports have come from the state of Massachusetts (see: <https://www.mass.gov/info-details/artificial-turf-fields>) and the U.S. Environmental Protection Agency (EPA) (see: <https://www.epa.gov/chemical-research/federal-research-recycled-tire-crumb-used-playing-fields>). Other research includes Zuccaro, P., et al, *Artificial turf and crumb rubber infill: An international policy review concerning the current state of regulations*, *Environmental Challenges*, Volume 9, December 2022, 100620. See: <https://www.sciencedirect.com/science/article/pii/S2667010022001767>

## Conservation Commission Votes: 2020 and 2023

**An Order of Conditions to install crumb rubber infill synthetic fields at Arlington High School was granted for three years by the Conservation Commission on July 23, 2020, after it reviewed plans for the fields and a drainage system designed to mitigate infill runoff into Mill Brook.**<sup>2</sup> The Commission discussed the Notice of Intent, reviewed supporting documents, evaluated plantings that come between the brook and the field, and studied the drainage system designed to protect Mill Brook from crumb rubber inflow at multiple meetings in 2020.<sup>3</sup> Detailed conversations about artificial turf occurred in several meetings.<sup>4</sup> By voting favorably, the Conservation Commission determined that the AHSBC met its burden<sup>5</sup> of proving that the fields would “not have a significant or cumulative effect upon the wetland values protected by the Bylaw.”<sup>6</sup>

The Conservation Commission has jurisdiction to review work on the high school fields because they are located within 100 feet of a water resource, Mill Brook, which flows into Mystic River and eventually to Boston Harbor.<sup>7</sup> Mill Brook stretches for three miles throughout the Town of Arlington, crossing or running alongside parks, parking lots, the Minuteman Bikeway, and roadways, including Massachusetts Avenue.<sup>8</sup> Thousands of vehicles, bicycles, and pedestrians wearing rubber products come near Mill Brook daily, generating substances that enter the brook and may have contact with fish and other wildlife.<sup>9</sup>

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<sup>2</sup> N. Stevens motioned to approve the project for 869 Mass Avenue under the Wetlands Protection Act and Arlington Bylaw for Wetlands Protection with the special conditions discussed by the Commission, P. Heidell seconded, D. White voted to approve, D. Kaplan voted to approve, C. Tirone voted to approve, S. Chapnick voted to deny, motion approved. <https://www.arlingtonma.gov/town-governance/boards-and-committees/conservation-commission/agendas-minutes>.

<sup>3</sup> The Conservation Commission discussed the Notice of Intent for the Order of Conditions on May 21, 2020, and held a public hearing that began on June 4, 2020, and continued on July 9, July 16, and July 23, 2020. The Commission visited the site on June 12, 2020 and discussed the visit on June 18, 2020. See: <https://www.arlingtonma.gov/town-governance/boards-and-committees/conservation-commission/agendas-minutes>.

<sup>4</sup> Please see Conservation Commission minutes of July 23, 2020 for studies shared by a Commission member. <https://www.arlingtonma.gov/town-governance/boards-and-committees/conservation-commission/agendas-minutes>.

<sup>5</sup> Arlington Regulations for Wetland Protection, Section 3B, defines the burden of proof standard as “a preponderance of the credible evidence from a competent source.” The U.S. Supreme Court has stated that “a preponderance of the evidence standard...simply requires the trier of fact to believe that the existence of a fact is more probable than its nonexistence before [he] may find in favor of the party who has the burden to persuade the [jury] of the fact’s existence. In *Re Winship*, 397 U.S. 358, 90 S.Ct. 1068 (1970).

<sup>6</sup> Arlington Regulations for Wetland Protection, Sec. 3B. See: <https://www.arlingtonma.gov/home/showpublisheddocument/64923/638174068252130000>. See also Title 5, Article 8, Section 6 of the Bylaws of the Town of Arlington: <https://www.arlingtonma.gov/town-governance/laws-and-regulations/town-bylaws/title-v-regulations-upon-the-use-of-private-property#A8>.

<sup>7</sup> Arlington Regulations for Wetland Protections, Section 2. [638174068252130000 \(arlingtonma.gov\)](https://www.arlingtonma.gov/home/showpublisheddocument/638174068252130000). See also Title 5, Article 8, Section 7 of the Bylaws of the Town of Arlington.

<sup>8</sup> Mill Brook Corridor Report, 2019. See <https://www.arlingtonma.gov/home/showpublisheddocument/46513/636921453433800000>.

<sup>9</sup> According to the Massachusetts Division of Fish and Wildlife, fish found in Mill Brook include American eels, Black Crappie, Bluegills, Golden Shiners, Largemouth Bass, Pumpkinseed, and White Suckers. Except for the American

At the July 2020 meeting with the Conservation Commission, the AHSBC presented a project schedule showing that work on the fields would be undertaken in 2024 and completed in 2025. Following the vote of approval, the project's contractor began to purchase materials and sign subcontracts for all bids in accordance with the Order of Conditions. This allowed the Town to lock in prices at the lower 2020 rates.

On July 20, 2023, the Conservation Commission held a public hearing to discuss extending the permit for the Arlington High School fields. According to the meeting minutes, a commissioner spoke of the "toxicity of crumb rubber washing into Mill Brook" and mentioned an abstract supporting this position.<sup>10</sup> The public hearing was continued to August 3, 2023, AHSBC representatives were invited, and two days prior to that meeting, AHSBC representatives were given a one-page abstract of a study stating that 6PPD-quinone, a chemical in rubber, is responsible for urban runoff mortality in coho salmon and other fish.<sup>11</sup>

The study was prompted by high fatality rates for coho salmon living in bodies of water near heavily trafficked roads. Tests conducted in static conditions concluded that exposure to 6PPD-quinone resulted in mortalities in brook and rainbow trout.<sup>12</sup>

**The commissioner said that the abstract represented new information, which allowed the Conservation Commission to deny a request for an extension and require the filing of a new application for a permit to complete the remaining work** "[W]here new information, not available at the time the permit was issued, has become available and indicates that the permit is not adequate to protect the resource area values identified in the Bylaw."<sup>13</sup>

The AHSBC representatives did not have time to research the information presented in the abstract and were not able to determine if the results of the study applied to the conditions on the high school fields that abut Mill Brook. The AHSBC chair told the Conservation Commission that the AHSBC did not intend to request a modification of the Order pursuant to Section 18 of the [Arlington Regulations for Wetlands Protection](#). The design team stated that the AHSBC and the Conservation Commission had a shared

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Eels, none of these fish can be found in the portion of the brook in the area adjacent to the fields or upstream from the part of the brook that abuts the new high school fields. The fields are located upstream from Cooke's Hollow, a section of the brook that drops and is marked by a small waterfall. Fish in the Mystic River include Alewife, American Eels, Blueback Herring, Bluegill, Brown Bullhead, Common Carp, Golden Shiners, Largemouth Bass, Pumpkinseed, White Perch, White Sucker, Yellow Bullhead, and Yellow Perch.

<sup>10</sup> See minutes of the July 20, 2023, Conservation Commission meeting: <https://www.arlingtonma.gov/town-governance/boards-and-committees/conservation-commission/agendas-minutes>. (Abstract title & author not provided in minutes.)

<sup>11</sup> Brinkman, M, Montgomery D, Selinger, S, et al, Acute Toxicity of the Tire Rubber-Derived Chemical 6PPD-quinone to Four Fishes of Commercial, Cultural, and Ecological Importance, American Chemical Society, 2022, 9, 4, 333-338. See: <https://pubs.acs.org/doi/abs/10.1021/acs.estlett.2c00050>.

<sup>12</sup> According to the abstract, "Fish were exposed under static renewal conditions, and exposure conditions verified analytically. Mortalities in brook trout occurred between 1.2 and 20 hours, while mortality began after 7 hours and spanned 60 hours in rainbow trout. No mortalities were observed after exposure of either char or sturgeon for 96 hours." See <https://pubs.acs.org/doi/abs/10.1021/acs.estlett.2c00050>.

<sup>13</sup> Section 17B of the Arlington Regulations for Wetland Protection states that the Conservation Commission may deny an extension "where no work has begun on the project." Commissioners noted that while work has begun, the AHSBC had not yet purchased the crumb rubber infill and can still evaluate other infills that may present less of an impact on Mill Brook. See also Title 5, Article 8, Section 4 of the Bylaws of the Town of Arlington.

desire to protect Mill Brook and referred to the Conservation Commission's 2020 careful review of the plan for the fields and the drainage system designed to limit infill flow to Mill Brook.

After discussion, AHSBC representatives agreed to review costs, risks, and benefits of crumb rubber and alternative infills and to study the applicability of the research in the abstract to the conditions on the Arlington High School fields.<sup>14</sup> As a result, the Commission voted to grant a one-year extension of the 2020 Order of Conditions to August 4, 2024.

## 2024 Conservation Commission Decision

For this meeting, eight months later, the AHSBC recognizes that the Conservation Commission has interest in learning about improvements to the drainage system on the turf fields and evidence of differences between tire abrade and turf with respect to 6PPD-quinone, and how this additional information demonstrates the requirements of protecting Mill Brook per the Arlington Bylaws for Wetland Protection.

The Commonwealth's Wetland Protection Act, M.G.L. Ch. 131, s. 40 and its corresponding regulations, 310 CMR 10.03(1)-(2), require the AHSBC to meet a burden of proof standard that balances the protection of the wetland with the needs of the project. While the law confers upon local conservation commissions the authority to issue permits consistent with the Act, courts have afforded conservation commissions "considerable deference" to the board's interpretation of both the enabling statute and the wetland regulations of their city or town.<sup>15</sup>

Even with "considerable deference," the Conservation Commission must show "a rational relation between its decision and the purpose of the regulation it is charged with enforcing,"<sup>16</sup> provide evidentiary support for its decisions,<sup>17</sup> and apply the burden of proof standard in a uniform and consistent manner on permit applications and other matters.<sup>18</sup>

Recognizing the need to "balance the protection of the wetland with the needs of the project," the AHSBC respectfully notes that the Arlington High School Building project is in its final, critical stages of work. The Conservation Commission's decision may impact the ability of the Town to complete the AHS project on time and on budget. Project delays and changes could jeopardize future state funding for capital projects in the Town's schools, impede the smooth operation of curricular and co-curricular activities at Arlington High School, and negatively impact the Town's high school students.

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<sup>14</sup> The Conservation Commission minutes of August 3, 2023, state that the AHSBC chair said materials need to be purchased by the spring of 2025. This is not correct. Materials need to be ordered by June 30, 2024, and installed in the spring/summer of 2025.

<sup>15</sup> J.M. Hollister, LLC v. Architectural Access Bd., 469 Mass. 49, 55 (2014).

<sup>16</sup> Fafard v. Conservation Comm. of Reading, 41 Mass. App. Ct. 565, 572 (1996); *see also* Fieldstone Meadows Dev. Corp. v. Conservation Comm. of Andover, 62 Mass. App. Ct. 265, 269-270 (2004).

<sup>17</sup> Roosevelt v. Conservation Comm'n of Edgartown, 90 Mass. App. Ct. 1119 (2016); Cf. Crawford v. Cambridge, 25 Mass. App. Ct. 47, 49 (1987).

<sup>18</sup> FIC Homes v. Conservation Comm'n, 41 Mass. App. Ct. 681, 684-85 (1996) "A decision is not arbitrary and capricious unless there is no ground which 'reasonable [persons] might deem proper' to support it." *Id.* at 4, citing T.D.J. Dev. Corp. v. Conservation Comm'n. of N. Andover, 36 Mass. App. Ct. 124, 128 (1994), quoting from Cotter v. Chelsea, 329 Mass. 314, 318, (1952).

While this memo primarily addresses the new information submitted at the August 3, 2023, meeting, it also includes background information on the project timeline and on the AHSBC's selection of the turf infill product to ensure the Conservation Commission has a fuller context of the needs of the Arlington High School Building project.

## **Arlington High School Building Project**

In 2013, the New England Association of Schools and Colleges (NEASC) determined that the facilities of Arlington High School were insufficient for teaching and learning. In 2014 and again in 2015, the school district and town leadership submitted Statements of Interest (SOI) to the Massachusetts School Building Authority (MSBA) to study options for the school, including the potential building of a new school. The MSBA approved the 2015 SOI, and in the fall of 2016, the Arlington High School Building Committee was formed to oversee the project.<sup>19</sup> AHSBC representatives participated in a process with the MSBA to select an Owners Project Manager and Architectural Design firm.

In partnership with the design team, the AHSBC oversaw a feasibility study from 2018-19, the schematic design was finalized in 2019, and **in June of 2019, Arlington voters approved a \$291 million debt exclusion to fund the new high school, with approximately 30% of the funds coming from the MSBA.** In presentations to Town Meeting, Town officials, and in voter forums, the AHSBC and design team shared detailed plans for the project, including plans for synthetic turf athletic fields.

The scope and plans for the fields, per the approved Order of Conditions granted by the Conservation Commission in July of 2020, were detailed in the Project Scope and Budget Agreement with the MSBA. In December of 2020, the AHSBC approved the guaranteed maximum price (GMP) for the project, and in that same month, the Town signed a Project Funding Agreement Amendment (PFAA) with the MSBA. The GMP documents submitted to the MSBA included the costs of the synthetic fields. Pursuant to the PFAA, the contractor for the project began soliciting bids for subcontractors and materials, including those associated with the approved synthetic fields.

## **AHS Project Timeline**

The new Arlington High school is being built in four phases, two of which are completed.<sup>20</sup> The first phase was the construction of the STEAM (Science, Technology, Engineering, Arts, and Mathematics) building and auditorium in front of the old school, which was completed in April 2022. The second phase was completed in December of 2023 and consists of the humanities wing, library, cafeteria, and the Menotomy Preschool. Phase 3, the construction of indoor athletic space, outdoor amphitheater, and black box theater, is underway and is scheduled for completion in February 2025.

**Site work on phase 4, including preparation of the artificial surface fields, has already begun and is estimated to be completed by September of 2025, with landscaping completing in November of 2025. The project needs to order the infill product for the synthetic fields by June 30, 2024.**

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<sup>19</sup> See 963 CMR 2.10 (3): <https://www.mass.gov/doc/963-cmr-2-school-building-grant-program/download>.

<sup>20</sup> See <https://ahsbuilding.org/> for more detailed information of the project timeline and other information.

## AHSBC Selection of Synthetic Turf Fields at the New High School

Throughout the project, the AHSBC has been conscious and thoughtful of its responsibility to deliver to the Town an environmentally friendly facility and duty to create fields that protect the town's waterways, wildlife, and vegetation. This can be seen in many decisions made by the AHSBC, including the final landscaping design, the retention of trees on the front lawn of the high school, and the goal of building a LEED-Platinum facility. When considering plans for the 174,000 square feet of fields at the new AHS, the design team for the project and the committee reviewed various reports issued by the Town, including the May 2018 report titled "Community Resilience Building Workshop: Summary of Findings & Recommendations,"<sup>21</sup> which discussed Mill Brook.

**After considering many options and environmental impacts, the AHSBC voted<sup>22</sup> to include synthetic artificial surface fields in the new Arlington High School to ensure that all students<sup>23</sup>, including student athletes, would have more playing, practice, activity, and exercise time outdoors.** The AHSBC concluded that synthetic turf surfaces significantly reduce the number of times games, practices, and other outdoor activities are postponed or canceled because of the weather and increase students' outdoor time. Educators noted that numerous studies show that exercising outdoors is better for mental and physical health.<sup>24</sup> The AHSBC heard from school district officials concerned about the Town's and district's ability to afford necessary staff and materials to maintain high-quality grass surfaces. Finally, the AHSBC was concerned about negative environmental impacts caused by high water usage and fertilizers required to maintain grass fields in top condition.

## Arlington's Experience with Turf and Grass Fields

The high school has had a turf field for soccer, football, lacrosse, and other varsity sports that has been used successfully by all students since 2005 (with the most recent replacement of the turf surface in 2015). The new fields, like the current turf field, are being built on an area of Arlington High School that has been capped because environmental contaminants were found deep beneath the surface in the late 1990s.

Arlington Public School leadership, including the Superintendent of Schools and high school principal in consultation with the Athletic Director, compared the school's own experience with a turf field and grass fields in Arlington and surrounding communities, and concluded that artificial surfaces were safer for students and provided much more playing time than local grass fields, which are challenging and costly to keep in good condition in New England weather. The principal noted in public meetings that all 1600

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<sup>21</sup> See [2017-2018-mvp-planning-grant-report-arlington.pdf\(Review\) - Adobe cloud storage](#)

<sup>22</sup> For discussions and votes taken, please see: <https://ahsbuilding.org/meeting-agendas-and-minutes/>. In addition to the value of increased playing time, the committee heard from school district officials concerned about the Town's and district's ability to have enough funds in annual operating budgets to pay for staff and materials needed to maintain high-quality, safe grass surfaces.

<sup>23</sup> AHS students must take four years of Wellness Education (formerly known as Physical Education) to graduate. See: <https://sites.google.com/arlington.k12.ma.us/ahs-scheduling/graduation-requirements>.

<sup>24</sup> Kimura T, Mizumoto T, Torii Y, Ohno M, Higashino T, and Yagi Y. *Comparison of the effects of indoor and outdoor exercise on creativity: an analysis of EEG alpha power*. Frontiers in Psychology, July 2023. (<https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2023.1161533/full#h2>)



Arlington High School students will use the fields at some point during the year, and that hundreds of student athletes will compete on the fields in varsity and sub-varsity sports each year.

## Product Specifications and Guidance Given to the AHSBC

The educators' observations about the benefits of synthetic surface fields were corroborated by presentations made to the AHSBC by a consultant hired by HMFH, the design firm for the high school project. **The consultant's research showed that synthetic infill turf fields provide the Owner and users of these fields with as much as three times the useful hours per field as high end natural turf grass fields.** Turf fields are constructed of synthetic materials and therefore do not undergo the constant wear and breakdown normally associated with natural turf grass fields. In addition to improved durability, synthetic infill turf fields, if properly engineered, provide a level of surface consistency, uniformity, and biomechanical performance equal to that of high-end natural turf grass fields. The consultant's analysis showed that the required maintenance person hours for synthetic fields are less than 25% of that needed for a similarly sized natural turf grass field. Note that given the shortage of playing space in town, Arlington has never been able to maintain a natural turf grass field at a "high-end" standard.



The consultant explained that a properly engineered and constructed synthetic infill turf field consists of a resilient pad beneath the carpet and infill system with less resilient infill located within the fiber matrix. The combination of these components provides a cushioning surface below the carpet and a firm, athletic performance grass-like surface on top.

The system designed for Arlington High School will have GMAX scores (surface hardness score assigned to an athletic field) ranging from 80 to 120 (the ratio of the maximum acceleration experienced during impact), and head injury criteria values (the likelihood of head injury coming from impact) of less than 1,000 HIC (head injury criterion) for a one-meter drop in height. This results in key biomechanical performance characteristics in the range of a [FIFA-quality](#) field and reduces impact injuries, including head injuries, to athletes.

The consultant explained that synthetic turf fields can be too hot to play at high temperatures, and several attendees of meetings about this element of the project noted this as well. The high school principal indicated that a hot surface almost always coincides with extreme heat, which results in the cancelation or postponement of games and practices.



## Turf Field Infill Specifications

After much discussion and review of several [studies](#)<sup>25</sup>, the AHSBC chose styrene butadiene crumb rubber as the infill for the synthetic fields. The product has the longest track record of safety and longevity in the artificial athletic surface industry, and it is the same product that Arlington High School has used for its synthetic surface field since 2005. The high school principal has noted that students and student athletes have had positive experiences using the current turf field at the high school. In 2020, the AHSBC discussed emerging turf alternatives but felt none of them had enough experience to warrant their selection.

The specifications<sup>26</sup> for crumb styrene butadiene rubber synthetic infill were included in the request for the Order of Conditions approved by the Conservation Commission in 2020. The project plan is to place an order for this material, which is free of hazardous materials as defined by state and federal regulations, by June 30, 2024. **The infill will conform to the Standard Consumer Safety Specification for Toy Safety** and meet the following conditions:

- The infill rubber will be from recycled automobile tire crumb from tires manufactured in the U.S. only. SBR rubber will be free of hazardous materials as defined by current EPA regulations, 100% free of metals and metal cords, 99% free of non-metal fibers and other contaminants. The crumb rubber must be clean and free of rubber dust.
- Mineral Infill Material: Sand shall be rounded to sub-rounded silica sand quartz mineral sand, which is free of slits, clays, dust, and other contaminants.

Please see the appendix for more information.

## Drainage Strategy: Mitigating Impact on Mill Brook

Conservation Commission members and members of the AHSBC design team extensively reviewed the design of the drainage system for the new fields in 2020. **The drainage system was an important factor in deliberations that led the Commission to conclude that the crumb rubber infill fields would not have a “substantial or cumulative impact” on the resource (Mill Brook) in 2020.**

**Following the August 2023 meeting with the Conservation Commission, the design team discussed ways to further strengthen the drainage system.** The result was the addition to the design of trench drain baskets, which will provide an additional filter to prevent the flow of turf infill into Mill Brook. The AHSBC looks forward to reviewing this added feature with the Conservation Commission on April 4, 2024.

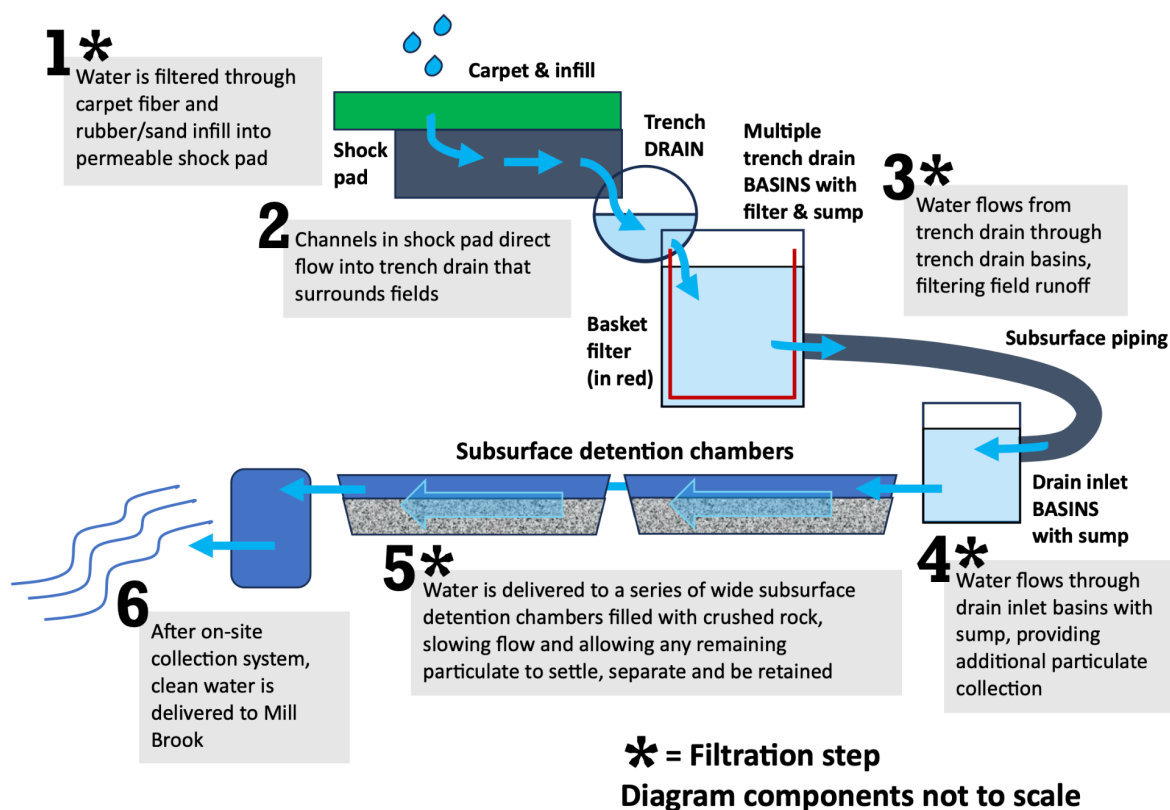
The drainage system design, which has been purchased except for the trench drains, mitigates infill flow to Mill Brook through the following strategy:

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<sup>25</sup> See also: <https://doh.wa.gov/community-and-environment/schools/environmental-health/synthetic-turf#> and <https://www.turi.org/content/download/11980/188623/file/TURI+Report+2018-002+June+2019.+Athletic+Playing+Fields.pdf>.

<sup>26</sup> The specifications showed that the product met U.S. safety standards, specified the use of U.S. made tires, which have higher standards for chemical compounds than tires made in many other countries, and other considerations.

## Drainage System Overview



### Step 1: Carpet Fiber and infill filtration

- The grass blades consist of a dual fiber system, both monofilament and silt film fibers, with infill material depths set to allow greater than average exposed fiber above the top of the infill.
- The fibers in the dual fiber system with increased exposed fiber height provide a level of fiber interlock, which reduces infill flyout and movement of infill via runoff.
- The  $\frac{3}{4}$  inch sand layer located below the rubber infill acts as a particulate filter before water even enters the drainage system.

### Step 2: Permeable shock pad directs flow to trench drains

- Directly under the carpet, blades, and infill materials is a permeable shock pad, which includes channels to direct the water to the trench drainage system along the field edges.
- An impervious layer barrier sits directly below the shock pad, preventing surface water from entering the contaminated soil and groundwater below the site.
- The sports fields and their associated resilient underlayment pad and liner are gently sloped to direct flow into the below grade perimeter trench drains.

Step 3: Trench drains pass flow to trench drain basins with filtration and sump

- Runoff and pad level flow enters the trench drain and is directed into trench drain basins which will be equipped with a stainless-steel screened filter basket intended to intercept any solids which may get past the fiber matrix on the surface.
- In the trench drain basins, flow is directed through the filter screens before entering the subsurface piping system.

Step 4: Inlet basins with sump provide additional interception of particles

- Runoff travels into the subsurface detention via a closed piping and basin network. Both the trench drain basins and the drain inlet basins are equipped with sumps to further intercept any fine particles that may exit over the top of the surface trench drain inlet.

Step 5: Subsurface detention chambers with crushed stone slow flow and allow sedimentation

- Water from the inlet basins is piped to the subsurface detention chambers, which are a series of underground storage chambers filled with crushed stone. These chambers slow the water velocity, increasing the ability to settle particulate matter, which may pass through the basket filter and sumps. The detention chambers are fully wrapped within an impervious membrane.

Step 6: On-site collection system and maintenance

- Water flows from the chambers and into the on-site collection system, then into Mill Brook.
- Trench drain filter baskets and inlet basin sumps will be cleaned on a regular basis as described in the maintenance plan.

**Note that the trench drain baskets (seen in Step 3) are a new addition to the drainage system to help address concerns raised by the Conservation Commission. The combination of the system components – the interlocking behavior of the dual fibers, the reduced volume of resilient infill materials, and the trench drain baskets – greatly minimizes the potential of infill material migrating towards Mill Brook. The design of the drainage system sets the standard for protecting waterways in Arlington.**

## Maintenance

The school district will adhere to the maintenance and operation plan in the appendix for the new turf fields. The highlights of the plan include:

- The school district intends to keep the fields in pristine condition as specified in the maintenance plan.
- The district will purchase approved grooming equipment, and the fields will be groomed once per week for the first two months to remove excess or loose fibers. Following the break-in period, the school district will groom the field following approximately 100 hours of use or no less than once per month, whichever is first.
- Grooming will be done in the same direction as the seams to avoid excess wear on seam areas.
- In areas of repetitive play, district staff will brush the infill back in place as needed.
- Following special events, the district will brush the field of debris, and spill of a foreign substance or bodily fluids will be removed as quickly as possible.

- Foods, substances, and treatments that may dirty or harm the surface, such as peanut shells, sunflower seeds, tobacco products, harsh chemicals, metal cleats, wire bristle brushes or brooms, and pressure water systems will be forbidden.

**Summary of Recommended Maintenance Program (including drainage system maintenance):**



19-Mar-24

AHS - Synthetic Infill Field Recommended Maintenance Program
Synthetic Turf Field Maintenance (Based on a 52 Week Use Period)

Maintenance Activity	Hours Per Year	Hours Per Maintenance Activity	Maintenance Frequency (Times Per Year)
Cleaning	96	4	24
Grooming	48	4	12
Repairs	8	4	2
Topdressing Low Areas	52	1	52
Painting	NA	NA	NA
Trench Drain Basket Cleaning	192	16	12
Trench Drain Flush	16	16	1
Inlet Basin Sump Cleaning	24	24	1
Total Man Hours	436		

Weeks of Use Per Year (60 Hours Per Week)	52		
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Use Hours Per Year (60 Hours Per Week)	3120		
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Maintenance Hours Per Hour of Use	0.14		
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## Turf Infill Alternatives

At the request of the Conservation Commission and pursuant to the one-year extension granted in August of 2023, the AHS project team evaluated several infill alternatives. As the AHSBC first learned at the start of its conversations about turf infill, research shows that no infill product is free of concerns of the impact of chemical substances to the environment.<sup>27</sup> The Norwegian Environmental Agency found

<sup>27</sup> Massey, R, Pollard, L, Harari, Homero. *Artificial Turf Infill: A Comparative Assessment of Chemical Concerns*. New Solutions: A Journal for Environmental and Occupational Health Policy, Volume 30, Issue 1, 2020. See <https://journals.sagepub.com/doi/full/10.1177/1048291120906206#bibr4-1048291120906206>.

that none of the alternative infills it reviewed were “significantly superior” to tire crumb in terms of “performance, cost, maintenance needs, and health and environmental impacts.”<sup>28</sup>

With most components of the field purchased (except for the infill) and the design completed, there are limitations on what can change in the new fields. The AHSBC reviewed two classifications of alternative organic infill that can be used in the new AHS fields as designed: those made of soft, and hard, materials.

The soft organic materials have both longevity and biomechanical concerns. Softer infill materials absorb moisture and include naturally processed coconut fiber, pure cork, granules, and other natural fibers. In “freeze-thaw” environments found in current New England climate, the absorbed moisture expands and breaks the infill material down to a finer size. In extremely wet conditions, the ability to attenuate impacts is reduced giving the material a wide range of negative biomechanical performance behavior. **A recurring issue with soft infill products is that the infill breaks down every few years because of cleat usage; the Town would need to purchase replacement infill every three to four years. As a result of this information, the AHSBC chose not to price and evaluate any soft organic infill products.**

Hard organic infill products are made from walnut shells, yellow pine trees, or olive pits. These products absorb less moisture than the softer materials but are hydrophilic to some extent (they tend to attract and retain water). The AHSBC evaluated four hard organic infill surfaces:

- Envirofill<sup>29</sup>, an acrylic-coated sand product composed of sand, a proprietary acrylic, Microban antimicrobial, and a pigment. The product first came to market in 2005.
- Brock Fill, a hard organic wood particle infill made from southern pine. This product requires the owner to use the company’s proprietary resilient drainage pad<sup>30</sup>, the material underneath the carpet. This product was first installed in 2019 and has been installed at a few area high schools in recent years.
- Safeshell, a walnut product introduced to the market in 2017.
- Safeshell Smoothplay, a walnut product released by the manufacturer of Safeshell and first installed on fields in 2020-21.

The AHSBC evaluated the costs and benefits of the alternatives and concluded that using any of them was too high of a risk for the Town and its school system. **Brockfill<sup>31</sup>, Safeshell, and Safeshell**

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<sup>28</sup> Bauer B, Egebaek K, Aare AK. *Environmentally friendly substitute products for rubber granulates as infill for artificial turf fields. Report M-955/2018*. Oslo, Norway: Norwegian Environmental Agency, (2018, accessed 14 December 2018).

<sup>29</sup> This is the alternative infill selected by the AHSBC in 2020. At the time of the decision, the product had been in the market for approximately 15 years. The committee only wanted to consider an alternative with a degree of experience. However, some AHSBC members have raised concerns about environmental impact. In addition, at the August 3, 2023, Conservation Commission meeting, a Commissioner raised concerns about Envirofill because of the potential of acrylic and Microban entering the waterway.

<sup>30</sup> The ProPlay 23D pad for the crumb rubber infill will not work for Brock Fill. It will work for other infills, including Envirofill, SafeShell, and SafeShell Smoothplay. Purchasing this product limits the ability of the Town to purchase a different infill product in the future.

<sup>31</sup> AHSBC members and Arlington Public School staff have had discussions with parents, student athletes, and colleagues in other districts about Brock Fill, which was installed in 2021 at Minuteman Tech High School and other schools in the area. Some sources have told the AHSBC that the wood chips on the Brock Fill fields “tore up pants,” “caused cuts on bare skin,” and “hurt more than rubber pellets when sliding.” Others have praised the surface as cooler than crumb rubber. One official at another school using the product said that the Brock Fill surface is more

**Smoothplay have been used in a few fields to date in New England, but require more experience and testing before the building committee is comfortable purchasing any of them.** The materials are slippery for student athletes in cold weather, do not have long-term track records of success, and have not been proven safer.

Crumb Rubber infill remains the safest, most durable, and most proven product available currently. The committee and the Town are committed to studying alternative infills that can be installed in a decade when the fields need to be replaced. We ask the Conservation Commission to join the AHSBC in taking a long-term view of the infill used in this field.

## Summary of Alternative Infills<sup>32</sup>

Below is an analysis of alternative products and costs examined by the AHS project design team.

Product	Materials	Cost	Durability/ long term costs	Impact on athletes/ activities
<b>Crumb Rubber</b>	Synthetic Crumb Rubber	\$147,000 (Baseline budget)	<ul style="list-style-type: none"> <li>• Most tested product on the market</li> <li>• Used in fields throughout the U.S. with good results in northern New England (MA, NH, VT, ME)</li> <li>• Designed for one cycle (10-12 years)</li> <li>• Fields routinely guaranteed for 8 years or more</li> </ul>	<ul style="list-style-type: none"> <li>• Most comfortable for athletic competitions based on feedback from athletic directors and students</li> <li>• The rubber compresses more when an athlete moves and turns.</li> <li>• Moisture between particles in the infill drains more quickly than organic infill products, making the fields less slippery and more usable after cold and wet periods.</li> <li>• The surface is softer when sliding, particularly for an athlete wearing shorts.</li> <li>• Generally a hotter surface than organic products.</li> </ul>
<b>Brock Fill</b>	Pine	\$190,000 additional cost	<ul style="list-style-type: none"> <li>• Product has only been available for five years</li> </ul>	<ul style="list-style-type: none"> <li>• Subject to water absorption, which impacts performance in cold temperatures.</li> </ul>

slippery in wet weather, has some drainage issues, and freezes more than the crumb rubber surface formerly in use. Another source said slippage may be due to athletic footwear rather than the surface. All have noted that the surface is only 1-3 years old at their schools and needs more time to evaluate. This information convinced the AHSBC to continue with crumb rubber and evaluate the experience other districts have with Brock Fill and other products over time.

<sup>32</sup> The 2023 Arlington Town Meeting voted to establish a Turf Study Committee to evaluate artificial turf surfaces to inform future town projects. Town Meeting discussions prior to the establishment of the committee included debate on warrant articles excluding the Arlington High School project from a potential ban on artificial turf fields in Arlington. The Turf Study Committee has not reviewed the AHSBC decision-making on the synthetic turf surfaces, looked at the design of the high school field, or met with the AHSBC or its design team. The Turf Committee's report may inform future decision-making by the school department when it comes time to replace the synthetic fields at Arlington High School. The AHSBC has considered some of the reports and research materials that are being reviewed by the Turf Study Committee.

		above baseline	<ul style="list-style-type: none"> <li>• No long-term data available on longevity, durability or safety as product ages</li> </ul>	<ul style="list-style-type: none"> <li>• Some athletes and coaches have noted the surface is slippery in cold temperatures</li> <li>• Does not have the give of a crumb rubber infill</li> <li>• Student athletes who slide in shorts on this surface say that the wood chips cause more cuts and abrasions than they experience on a crumb rubber surface.</li> <li>• Usability issues reported in spring and fall because of freezing temperatures.</li> <li>• Surface is cooler than crumb rubber.</li> </ul>
<b>Envirofill (hard infill)</b> <i>(Project team priced this option during schematic design)</i>	Sand coated with acrylic	\$430,200 additional cost above baseline	<ul style="list-style-type: none"> <li>• Water-based paint product (not synthetic), with particles also coated with Microban</li> <li>• Has a 16-year warranty</li> </ul>	<ul style="list-style-type: none"> <li>• Requires a thatch layer, which helps stabilize the Envirofill.</li> <li>• Athletes will notice a modest difference in the give of the surface when they turn and cut</li> <li>• It is not as stable as SBR crumb rubber for turns and stops.</li> <li>• Traction is decreased with this product.</li> </ul>
<b>Safeshell (hard infill)</b>	Safeshell (walnut base) and sand	\$280,000 additional cost above baseline	<ul style="list-style-type: none"> <li>• Product has only been available for seven years</li> <li>• No long-term data available on longevity, durability or safety as product ages</li> <li>• More susceptible to freeze-thaw cycles than crumb rubber</li> <li>• Uncertain as to when the district will need to add more material.</li> </ul>	<ul style="list-style-type: none"> <li>• Has 100 installations (approximately) nationwide.</li> <li>• It is less stable for turning and stopping than Envirofill because it is made of larger particles.</li> <li>• Not as good for rapid turns and cuts as crumb rubber.</li> <li>• Traction diminishes, particularly in colder weather.</li> <li>• Takes longer to thaw after a freeze than a synthetic crumb rubber product.</li> <li>• Potential usability issues in spring and fall with freezing temperatures</li> </ul>
<b>Safeshell Smooth Play (hard infill)</b>	Safeshell Smoothplay (a finer walnut product) and sand	\$300,400 additional cost above baseline	<ul style="list-style-type: none"> <li>• Product has only been available for three years</li> <li>• No long-term data available on longevity, durability or safety as product ages</li> <li>• Absorbs water more than the Safeshell (good for cooling, not for longevity)</li> </ul>	<ul style="list-style-type: none"> <li>• Not enough history for this product. A few installations, mostly in the Midwest.</li> <li>• Traction diminishes, particularly in colder weather.</li> <li>• Potential usability issues in spring and fall with freezing temperatures</li> </ul>





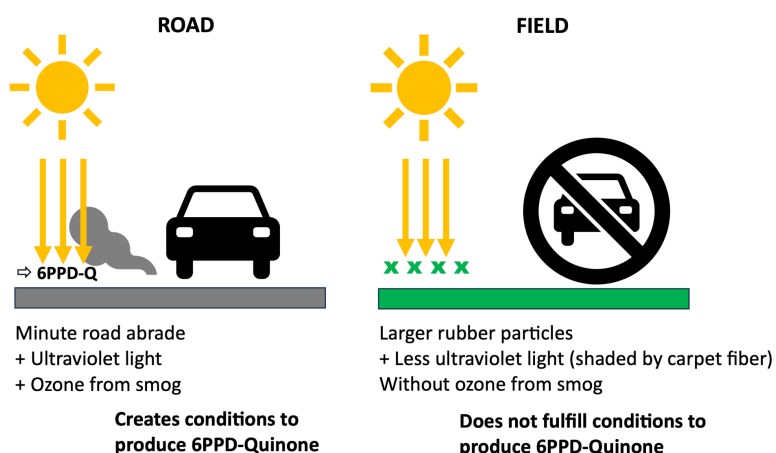
0.03937 inch (1,000 micron).<sup>37</sup> Under the combination of sunlight, heat, and ozone, the tire antioxidant 6PPD is transformed into 6PPD-quinone, which can be lethal to some fish.

**To evaluate the relevance of this study to the design of the new AHS fields, it is necessary to understand the difference in conditions in turf fields and roadways.**

On roadways, tire abrade is generated on smooth highway surfaces by the road wear of tires, subjected to sunlight and high heat, converted by ground ozone from smog, and washed into receiving environments. The size range of the particles from tires on roadways, their exposure to compounds, the conditions necessary to transform 6PPD into 6PPD-quinone, and the conditions of their placement and potential migration are significantly different from the environment present at the location where the AHS fields and Mill Brook come close to one another.

The design of the new AHS fields greatly limits both the potential to create 6PPD-quinone and to allow it to be transferred to the brook. There is no source of ground ozone, and the fibers shade the particles reducing exposure to UV light. The infill particles are significantly larger than tire abrade (see diagram). The drainage system controls the migration of SBR crumb particles by minimizing surface slopes and thereby runoff velocities, minimizing the likelihood of particle migration, and by utilizing a denser fiber matrix that traps particles. The system is strengthened by drain basin filter baskets that intercept any migrating particles before they enter the subsurface chambers, and through low-height, wide chambers filled with crushed stone to slow flow, allowing any remaining particles to settle and be retained. Continued monitoring and maintenance of these filters as outlined above and in Appendix 5 is the final part of the system.

#### Production Conditions for 6PPD-Quinone



**The study presented by the Commission in 2023 raises valid issues about the impact of 6PPD-quinone entering water bodies from roadways. It does not, however, present evidence that the crumb rubber infill design of the new Arlington High School fields will generate 6PPD-quinone to harm fish in Mill Brook.**

<sup>37</sup> Federal Institute of Hydrology, Tyre and road wear particles (TRWP) - A review of generation, properties, emissions, human health risk, ecotoxicity, and fate in the environment, Federal Institute of Hydrology and Am Mainzer Tor 1, 56068 Koblenz, Germany, Federal Highway Research Institute, Brüderstraße 53, 51427 Bergisch Gladbach, Germany, Published by Science of The Total Environment, Volume 733, 2020, © 2023 His Majesty the King in Right of Canada and The Authors, <https://doi.org/10.1016/j.scitotenv.2020.137823>.

## Finances

The Arlington High School Building project is funded by a debt exclusion (providing funds from the Town's taxpayers) and funding from the state of Massachusetts. Once a project funding agreement is set, the Town is obligated to stay within the project budget and has limited options for moving outside of the approved budget. The Town cannot simply add more funds after the project has begun. **Because of the specific project agreement signed with the Massachusetts School Building Authority (MSBA), the MSBA has sole discretion to determine whether any additional funding added to the project is considered eligible. If the funding is deemed ineligible by the MSBA, it would then proportionally decrease the Towns Maximum Total Facilities Grant portion, so the town would lose additional project reimbursement funds.**<sup>38</sup> Instead, any changes to the project budget would require the AHSBC to vote to use contingency funds.

The total committed costs of the turf fields component of the project are \$1,234,700. The AHSBC has awarded seven subcontracts related to the turf fields:

- Sitework – J. Derenzo
- Turf Fields – Spinturf
- Electrical (including stadium lighting) – Griffin Electric
- Athletic equipment – RH Lord
- Landscaping – Emanouil
- Concrete – Riggs
- Fencing – Union Fence

**Any material changes in the plans for the fields will cause the locked-in subcontract values to increase to today's costs, which will reflect multiple years of double-digit inflation vs 2020 prices.** Additionally, if a contract is canceled, a subcontractor is likely to bring a loss of revenue claim against the project. Completed site work includes permavoid and the anchor trench system, which are stored on site.

## Contingency Funds

At the August 3, 2023, meeting, the Conservation Commission asked if the AHSBC could use contingency funds for an alternative infill. **The AHSBC does not believe there are enough funds in contingency at this point in the project to purchase an alternative turf infill. Even if sufficient funds were available, the AHSBC, the school district's leadership, and the project design team do not believe it is in the best interests of our students to purchase an alternative infill.**

The construction project began in 2020 with total contingencies of \$9,383,826 (\$7,587,280 for construction, and \$1,796,546 for soft cost contingency). As of March 8, 2024, with an estimated 20 months remaining in the project, below is a summary of the contingencies and funds spent and available.

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<sup>38</sup> See MSBA Project Funding Agreement, Section 3.11.

<b>Contingency Type</b>	<b>Funds available at the start of the project</b>	<b>Contingency spent to date</b>	<b>Major items</b>	<b>Remaining Contingency</b>	<b>% used</b>
<b>Construction</b>	\$7,587,280	\$5,085,016	Design coordination, owner and 3 <sup>rd</sup> party requested additional items, Phase 3-4 extension and unforeseen conditions.	\$2,493,264	67%
<b>Owners Soft Cost</b>	\$1,796,546	\$1,669,530	Building insurance costs, additional designer services, Phase 3-4 extension, and supplemental funds for moving and testing.	\$136,016	92%
<b>Totals</b>	\$9,383,826	\$6,745,546		\$2,629,280	72%

The AHSBC has used contingency funds for several unforeseen expenses. In 2022, as the AHSBC began planning the recently completed second phase of construction, the AHSBC determined that a shift in schedule would result in Arlington High School students being required to return to hybrid learning in the fall of 2023. Given the negative impact of the pandemic on our students, the AHSBC voted to spend \$1.2 million from the contingency to delay the demolition of a classroom building and athletic facility. This allowed students to have a normal start to the school year, with classes beginning in the new Humanities wing in the late fall of 2023.

The AHSBC has discussed several potential uses of remaining contingency funds, including making seat modifications on the balcony of the new auditorium. We expect to have other components of the facility that will need adjusting as we near the completion of the project, and our goal is to have as much contingency available as possible for those needs.

Notably, the project is entering a phase of construction with higher risks. In 2020, the design team discovered contaminants deep in the surface of the field area, which resulted in the elimination of geothermal wells and a redesign of part of the project. Phase 4 of the project – the fields and parking lots – will include the construction of a barrier wall in the field area where we had hoped to place the geothermal wells. The AHSBC needs to ensure a healthy amount of contingency funds are available in case of any future issues in that area of the project.

It is worth noting that any savings from the project will result in the Town of Arlington borrowing less money and paying less interest on this project.

For these reasons, the AHSBC is not comfortable using contingency funds for an alternative infill.

## AHSBC Vote on March 5, 2024

The AHSBC discussed the contents of this memo and all research presented at its March 5, 2024, meeting. Following discussion, the motion below was adopted unanimously by the committee:

*On a motion by Frank Callahan, seconded by Kirsi Allison-Ampe, M.D.,*

*It was moved that, after studying alternative organic infills for the fields at our new high school, evaluating the possibility of using project contingency funds, studying the safety and usage patterns of alternative turf infills, reviewing scientific data distinguishing infill in the new fields and substances from tires on roadways near waterways that may harm aquatic life, and taking steps to limit potential infill flow to Mill Brook through added safeguards in the design of the turf field's drainage system; the Arlington High School Building Committee (AHSBC) reiterates and restates its intention to purchase and install crumb rubber infill for the new high school fields, as approved by the Order of Conditions granted by the Conservation Commission in 2020, and, further, the AHSBC respectfully requests the Commission to extend the Order as permitted by the Arlington Regulations for Wetland Protection.*

## Financial Impact of a Negative Vote by the Conservation Commission

The building project must procure artificial infill for the new fields by no later than June 30, 2024. A vote to deny the extension of the Order of Conditions by the Conservation Commission and require the submission of a new application may delay completion of the project, increase costs, and delay the ability of our students and student athletes to participate in activities on the fields. It could also put components of the final stages of construction at risk (including the bike path extension), as removing them could be the only option to remain within budget. Delays in completing the project will result in delays in payments from the MSBA to the Town as well.

## Conclusion

The AHSBC respectfully requests an extension of the Order of Conditions for the following reasons:

1. The Conservation Commission determined in 2020 that the AHSBC met its burden of proving that the synthetic fields would “not have a significant or cumulative effect upon the wetland values protected by the Arlington Bylaws for Wetland Protection” after concluding that an appropriate system was in place to limit most infill from reaching Mill Brook.<sup>39</sup>
2. Pursuant to the specifications in the 2020 Order of Conditions granted by the Commission, the AHS project has designed systems for synthetic fields, signed seven subcontracts, purchased products, and manufactured parts of the synthetic turf field system. The deadline for purchasing the synthetic infill product for the fields is June 30, 2024, less than 90 days from the April 4 meeting.
3. Following the August 3, 2023, Conservation Commission meeting, the AHSBC has added an additional filtration step to the drainage system, which provides more protection to Mill Brook.

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<sup>39</sup> Please see Conservation Commission minutes of July 9, July 16, and July 23, 2020.

<https://www.arlingtonma.gov/town-governance/boards-and-committees/conservation-commission/agendas-minutes>.

4. The conditions at the site of the new fields are not the same as those that result in the creation of 6PPD-quinone on roadways. The research presented at the August 3, 2023, meeting, which prompted the delay in granting an extension of the Order of Conditions for three or more years, does not apply to the conditions present at the high school fields.
5. The non-applicability of the research in the abstract to the conditions of this project combined with the added safeguard in the drainage system meet the preponderance of the evidence standard that the synthetic surfaces at Arlington High School will “not have a significant or cumulative effect upon the wetland values protected by the Bylaw.”
6. The AHSBC and district leadership want a safe, reliable, and longest lasting surface for our students, and none of the alternative infills meet these criteria. (Please see the table above for more details).
7. The AHSBC needs to carefully manage available contingency funds, particularly as we enter the final 20 months of the project. Accordingly, the AHSBC believes it would be imprudent and unwise to use valuable contingency funds to purchase an infill product that does not have a long track record of success.
8. The school district’s educational leadership has determined that crumb rubber infill is currently the best and safest product for athletic competitions and other activities.

After reaching these conclusions and deliberating as requested by the Conservation Commission, the AHSBC voted unanimously on March 5, 2024, to reaffirm its decision to install crumb rubber infill in the synthetic fields at Arlington High School.

The AHSBC understands the attractiveness of some organic infill products suggested by Conservation Commission members. However, we remain unanimous that placing an unproven product on 174,000 square feet of field space used by the Town’s students and visiting athletes is an unwise investment of the Town’s and the state’s resources. We ask the Conservation Commission to recognize that infill products are replaced every ten years or so. When more data is available on the performance of alternative products, the Town may choose to purchase a different infill.

This memo attempts to clarify the evaluation of alternative infills, additional research done over the past six months, and project finances, all as requested by the Conservation Commission. After reviewing the data (including a strengthened drainage plan), the AHSBC reaffirmed its decision in selecting crumb rubber as the best alternative for this project. We appreciate the spirit of stewardship that prompted the Conservation Commission's requests, and hope this additional work provides the "preponderance of credible evidence from a competent source" necessary for an affirmative decision.

Thank you for reading this memo, and we look forward to answering your questions at the upcoming Conservation Commission meeting on April 4.

## **Appendices**

1. AHS Crumb Rubber and Sand Specifications
2. Turf and Drainage Information
3. Technical drawing of Flow Diagram w filter basket
4. AHS Turf Field Maintenance Plan
5. Memo by John Amato, P.E. (March 14, 2024)
6. Arlington High School Building Committee membership

# Appendix 1

**Arlington Hhigh School**  
**Specifications for synthetic turf infill material**  
**Page 1 of 2**

**1.08 SUBMITTALS**

- A. Environmental Health and Safety: Fiber and Infill materials shall be tested for compliance with the following:
1. Provide Independent Compliance Testing for compliance with ASTM F2765-14 Standard Specification for Total Lead Content in Synthetic Turf Fibers
  2. Provide Independent Compliance Testing for compliance with ASTM F3188-17 Standard Specification for Extractable Hazardous Metals in Synthetic Turf Infill Materials.
  3. Provide Independent Compliance Testing by an accredited and or approved laboratory for compliance with State Regulations for Per and Polyfluoroalkyl Substances (PFAS) in solids using EPA 537.1 Modified with Isotope Dilution techniques by Liquid Chromatography Tandem Mass Spectrometry (LC/MS/MS) by a laboratory accredited and or approved for these tests. Reporting limits shall not exceed 0.5 µg/kg (NYDEC part 375), and the reporting criteria shall be less than or equal to 1.0 µg/kg (NYDEC part 375). Turf fibers and backing materials shall be sampled using State Approved Protocol for soil sampling and results shall be compliant with the state approved thresholds. The testing shall include the following PFAS.



Test Method	Compound	Abbreviation	CASRN	PubChem NIH Safety Class
EPA 537.1	Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6b	Corrosive-Irritant
EPA 537.1	N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6	ENV Contaminant
EPA 537.1	N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9	ENV Contaminant
EPA 537.1	Perfluorobutanesulfonic acid	PFBS	375-73-5	Corrosive-Irritant
EPA 537.1	Perfluorodecanoic acid	PFDA	335-76-2	Corrosive-Acute Toxicity-Irritant
EPA 537.1	Perfluorododecanoic acid	PFDoA	307-55-1	Corrosive-Irritant
EPA 537.1	Perfluoroheptanoic acid	PFHpA	375-85-9	Corrosive-Irritant
EPA 537.1	Perfluorohexanesulfonic acid	PFHxS	355-46-4	Corrosive-Irritant
EPA 537.1	Perfluorohexanoic acid	PFHxA	307-24-4	Corrosive
EPA 537.1	Perfluorononanoic acid	PFNA	375-95-1	Corrosive-Irritant
EPA 537.1	Perfluorooctanesulfonic acid	PFOS	1763-23-1	Corrosive-Health Hazard-Irritant-ENV Hazard
EPA 537.1	Perfluorooctanoic acid	PFOA	335-67-1	Corrosive-Health Hazard-Irritant
EPA 537.1	Perfluorotetradecanoic acid	PFTA	376-06-7	Corrosive
EPA 537.1	Perfluorotridecanoic acid	PFTTrDA	72629-94-8	Unavailable at PubChem NIH
EPA 537.1	Perfluoroundecanoic acid	PFUnA	2058-94-8	Irritant
EPA 537.1	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9c	Unavailable at PubChem NIH
EPA 537.1	9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9Cl-PF3ONS	756426-58-1d	Corrosive-Irritant
EPA 537.1	4,8-dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4e	Corrosive-Irritant
EPA 533	Perfluorobutanoic acid	PFBA	375-22-4	Corrosive-Irritant
EPA 533	Perfluoropentanoic acid	PFPeA	2706-90-3	Corrosive
<b>Note: Includes compounds regulated in northeast states tested under both EPA 537.1 and EPA 533</b>				

**2.05 INFILL MATERIAL**

- A. Synthetic Infill and Mineral Material shall be free of hazardous materials as defined by current Local, State and Federal regulations. Infill shall conform to the Standard Consumer Safety Specification for Toy Safety. Synthetic surfacing manufacturer shall select infill materials that will assure their warranty of the synthetic turf system.
- B. Infill System: Synthetic/Sand Infill Material shall be installed at a material ratio that provides the performance characteristics required herein. The manufacture shall be responsible for providing the mix ratio and associated laboratory testing for compliance with performance requirements at the vendor specific ratios. All laboratory testing shall include reference to infill material ratios. Materials shall meet the following:
1. Infill System 1 Rubber shall be **recycled automobile tire crumb from tires manufactured in the United States Only (tires from SUVs or other vehicles or other sources shall not be acceptable)** SBR rubber free of hazardous materials as defined by current EPA regulations, 100% free of metals and or metal cords, 99% free of non-metal fibers and other contaminants. 100% of the rubber shall be smaller than 2.0 millimeters (#10 sieve) and no more than 2% passing the 0.600 millimeters (#30 sieve). The crumb rubber shall be clean and free of rubber dust. Recycled rubber from truck tires and industrial scrap or waste shall not be allowed. Variations are subject to review.



2. Infill Resilient Material shall comply with the following standards:
  - a. ASTM D395 250 degrees F at 6psi at loading: Loss of rebound: <5%, Cohesive Behavior: None, Agglomeration: None, Permanent Particle Deformation: None.
  - b. ASTM D412 500%
  - c. ASTM D624 800 psi Min. (1 MPa=145.04 psi)
  - d. ASTM D792 93.6 lbs/ft<sup>3</sup> Min (1.5 gm/cm<sup>3</sup>)
  - e. ASTM D5644 Per EPDM Gradation Table above
  - f. ASTM F963 Provide Independent Compliance Testing
  - g. DIN EN ISO 3451-1 >20%
3. Mineral Infill Material: Sand shall be rounded to sub-rounded silica sand quartz mineral sand which is free of slits, clays, dust and other contaminants. 100 percent of the sand shall be smaller than 1.18 millimeters (#16 sieve) and 98 percent shall be greater than 0.425 millimeters (#40 sieve). Testing shall be per ASTM F1632.

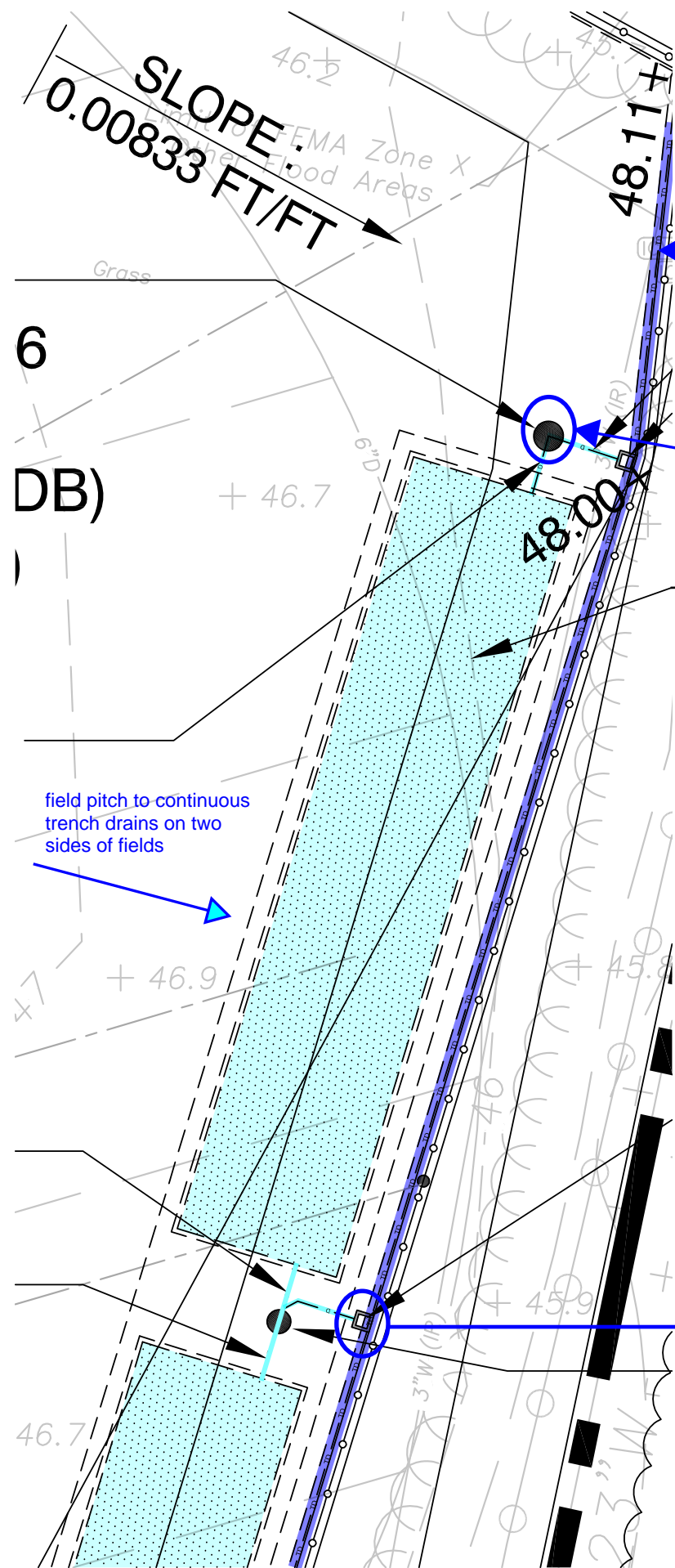
SAND MINERAL INFILL GRADATION	
Sieve Size U.S. No.	Typical Percent of Total within Range
16	0
18	<5%
20	10.0 to 40.0
25	20.0 to 50.0
30	20.0 to 60.0
35	20.0 to 50.0
40	10.0 to 40.0
50	<5%
Pan	<2%

- C. Infill Blending: Where required by Manufacturer's installation requirements, Infill material shall be a mixture of synthetic material and sand granule homogeneously blended. Sand component shall not be less than 60% or more than 80% by weight. The percentage of sand in the turf system may be adjusted as required to meet required performance criteria and avoid patent infringement. If infill ratios require modification to comply with the Performance Requirements in Article 3.08 the Manufacturer shall advise the OWNER in writing for Owner Approval of system modification and provide technical data indicating the requirement for the modification.
  1. Total settled infill depth shall be averaged over the entire field and shall be 1.50-inch depth for 2.00-inch fiber.
  2. Theoretical exposed fiber face weight shall represent the face weight of fiber located above the estimated settled infill depth of 74% of fiber height Regardless of any requirements set forth herein no system shall have a theoretical exposed fiber face weight which is less than 12 ounces per square yard minimum.

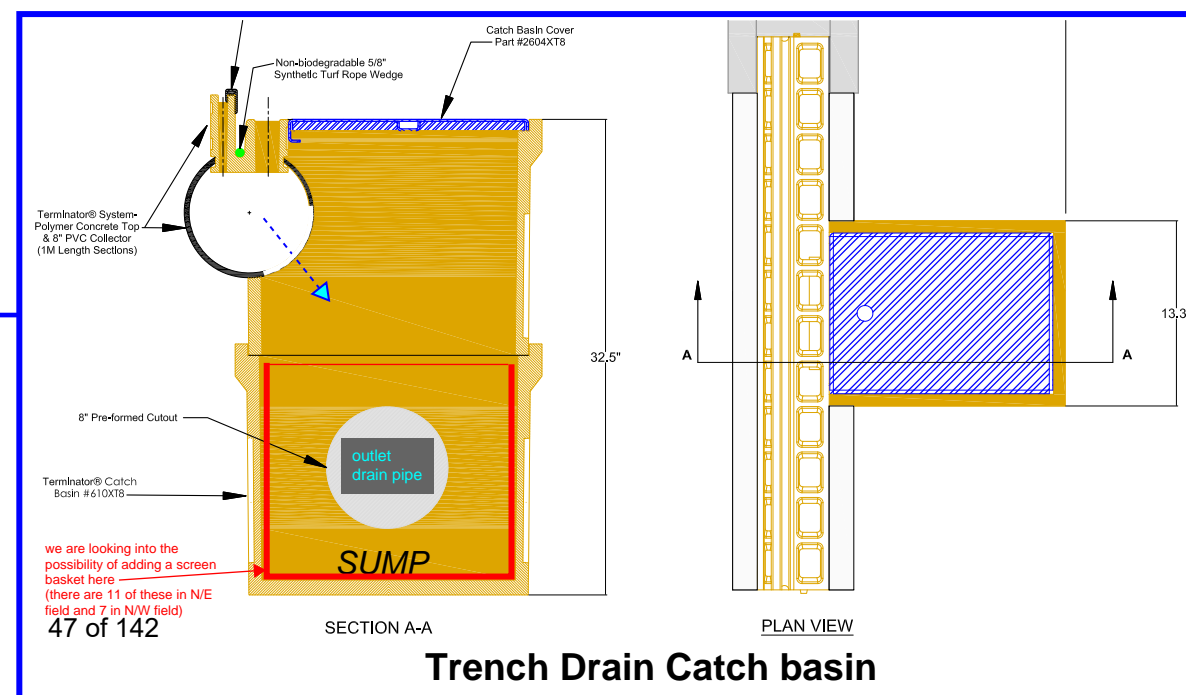
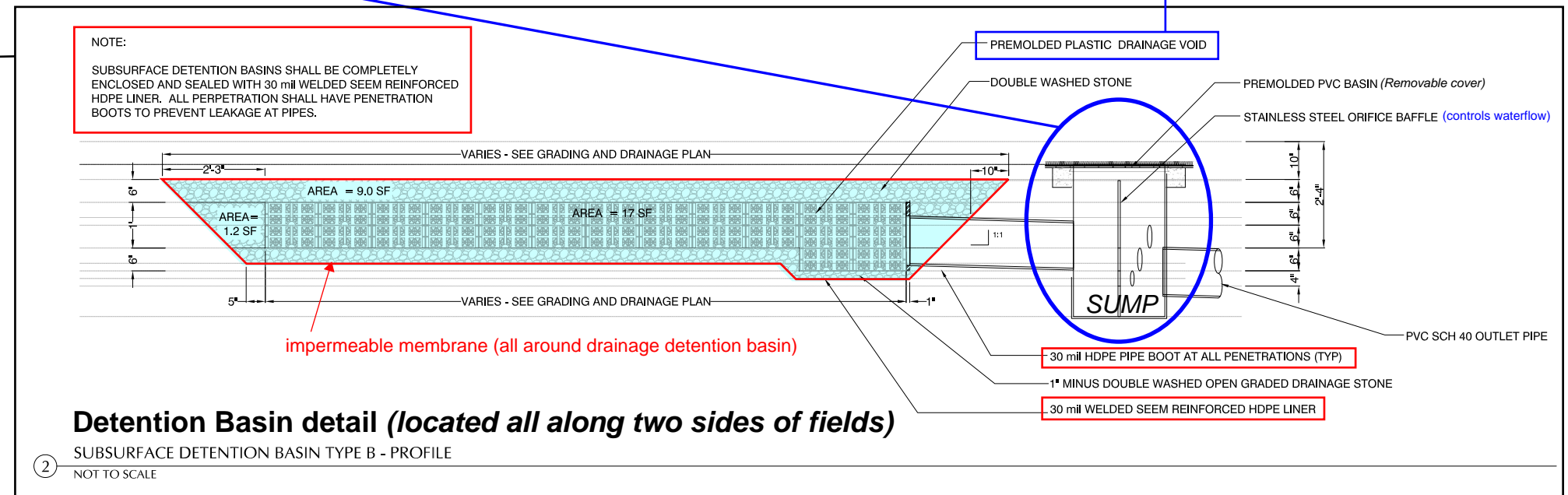
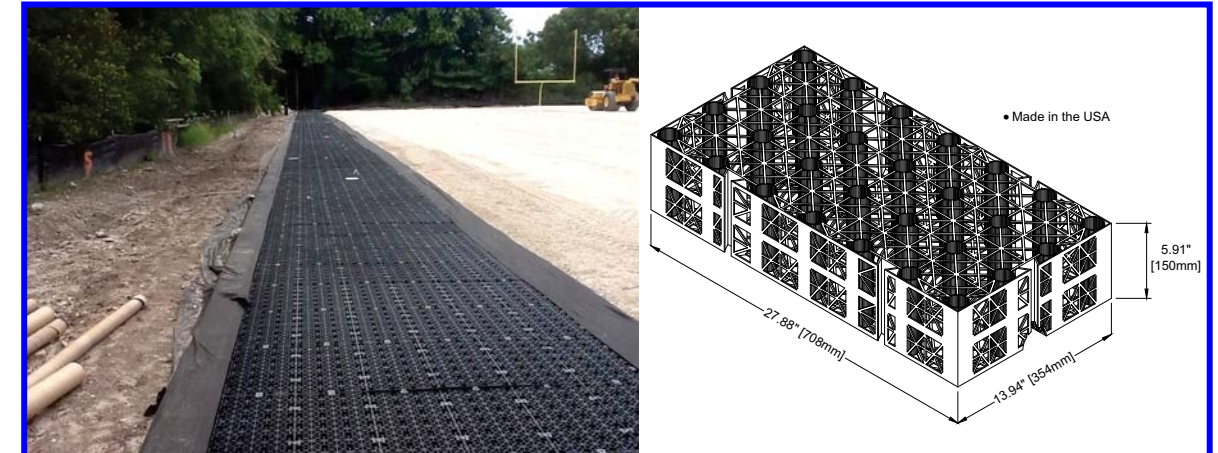
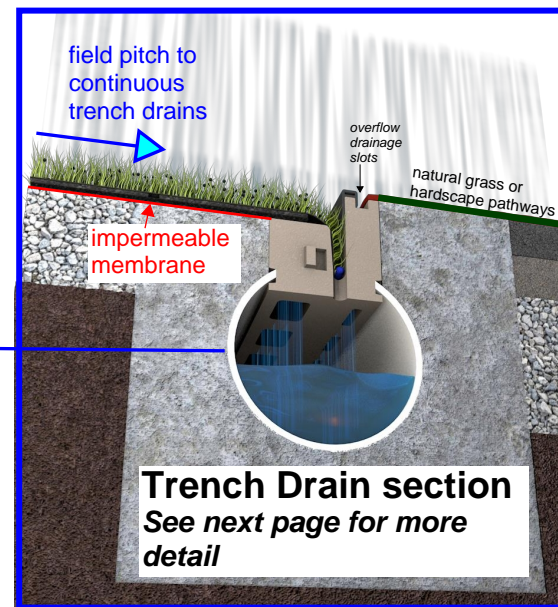
This ratio of sand and rubber crumb is different than most synthetic fields using the combination of rubber and sand. Typically the ratio is 70% Rubber and 30% sand. Here we will use a lower % of rubber due to the type of cushioned matt used under the synthetic turf carpet

SYNTHETIC INFILL / SAND RATIO	
Infill Composition by Weight	Based on manufacturer's requirements to meet require performance characteristics.
Infill System Depth	1.50-inch depth for 2.00 inch fiber after initial installation of infill material. This depth represents substantially 74% full.

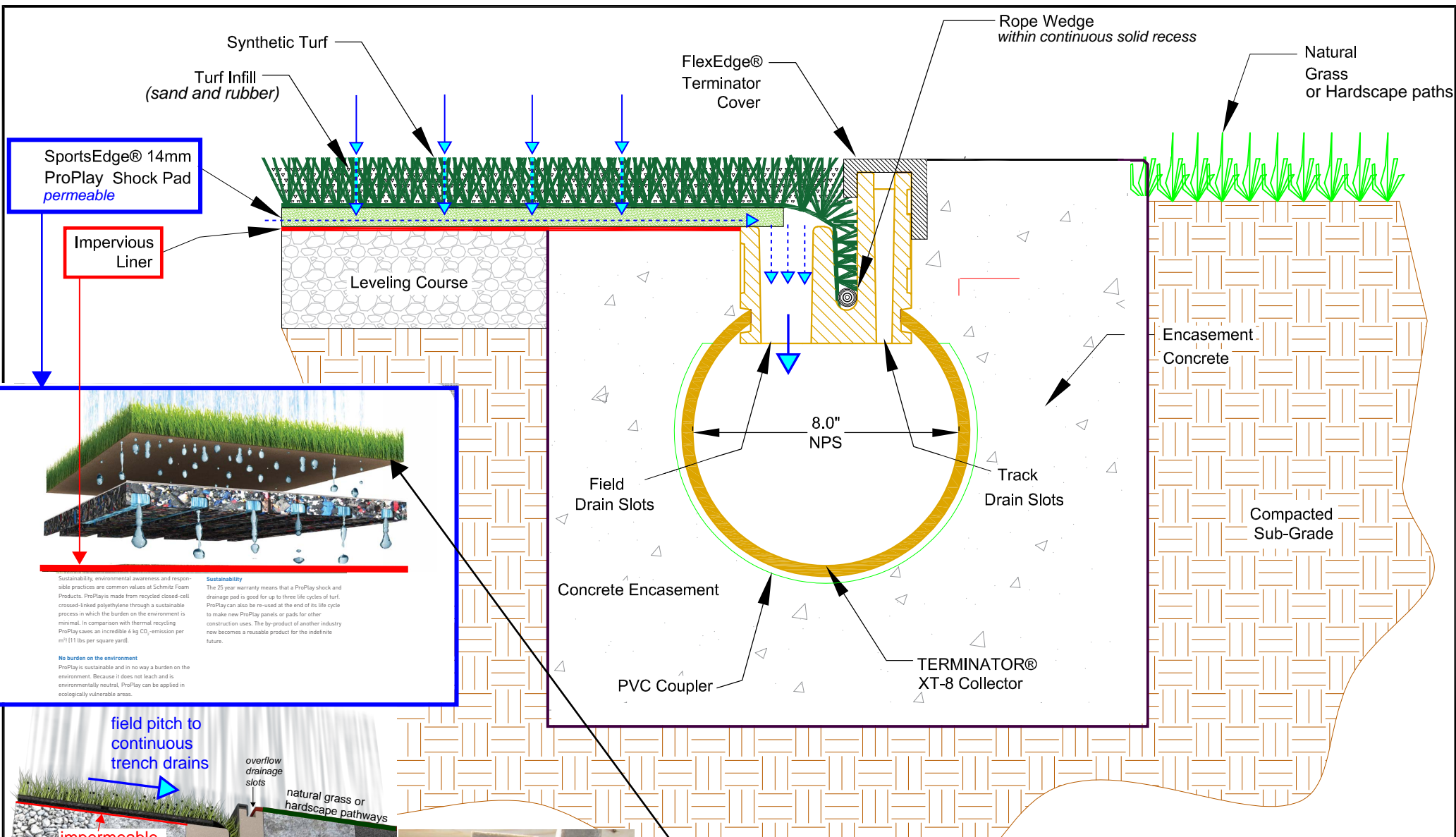
## Appendix 2



Representative partial plan of detention basin, collector pipes and trench drain







Sustainability, environmental awareness and responsible practices are common values at Sprinturf Foam Products. ProPlay is made from recycled closed-cell cross-linked polyethylene through a sustainable process in which the burden on the environment is minimal. In comparison with thermal recycling ProPlay saves an incredible 4 kg CO<sub>2</sub> emission per m<sup>2</sup> (11 lbs per square yard).

#### No burden on the environment

ProPlay is sustainable and in no way a burden on the environment. Because it does not leach and is environmentally neutral, ProPlay can be applied in ecologically vulnerable areas.

#### Sustainability

The 25 year warranty means that a ProPlay shock and drainage pad is good for up to three life cycles of turf. ProPlay can also be re-used at the end of its life cycle to make new ProPlay panels or pads for other construction uses. The by-product of another industry now becomes a reusable product for the indefinite future.

field pitch to continuous trench drains

impermeable membrane

overflow drainage slots

natural grass or hardscape pathways

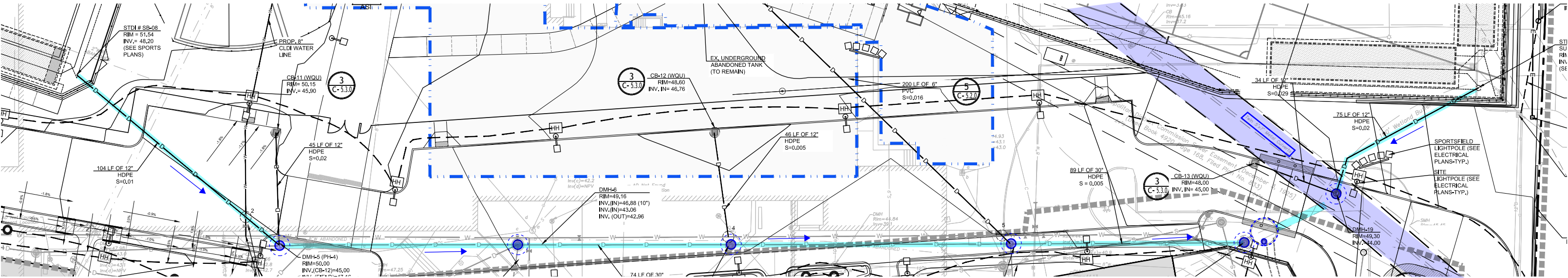
Sprinturf has the most dual fiber fields in the nation. DFE Extreme fields feature a 330 micron plus monofilament and a 120 micron plus slit film. Exclusively made in-house and in America.

The combination of monofilament and parallel-fibrillated fibers interlock to nearly eliminate infill flyout – a common complaint amongst athletes, coaches, and parents.

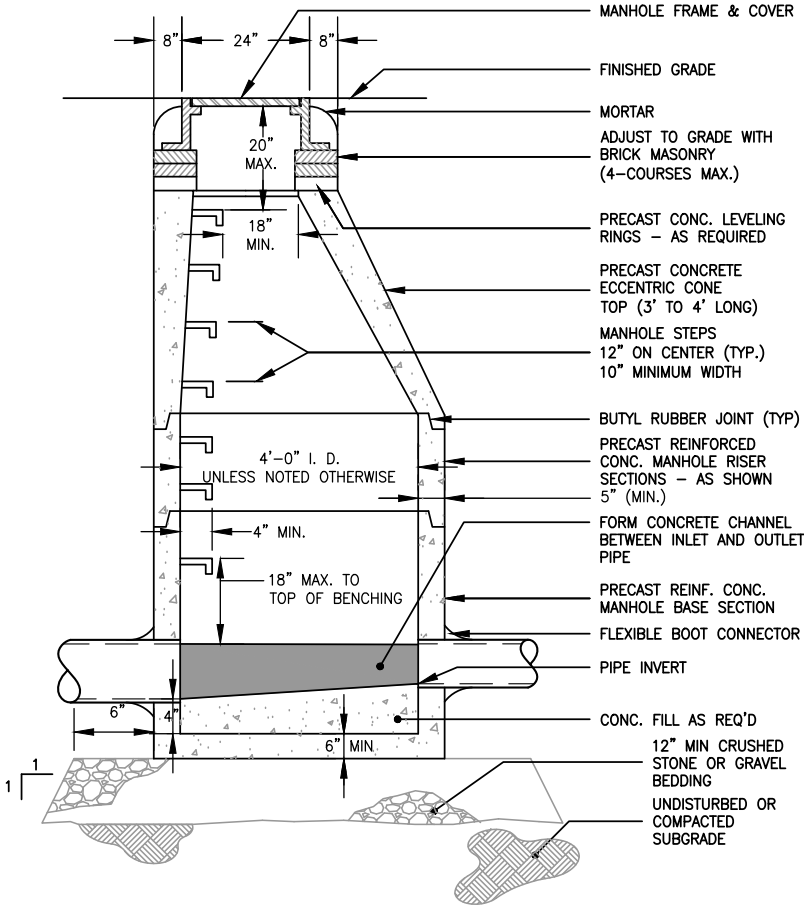
48 of 142

**AHS**  
synthetic turf  
drainage  
information

**2**



Partial Plan showing the two fields (south-east corners) collection drainage tying in to site storm drainage

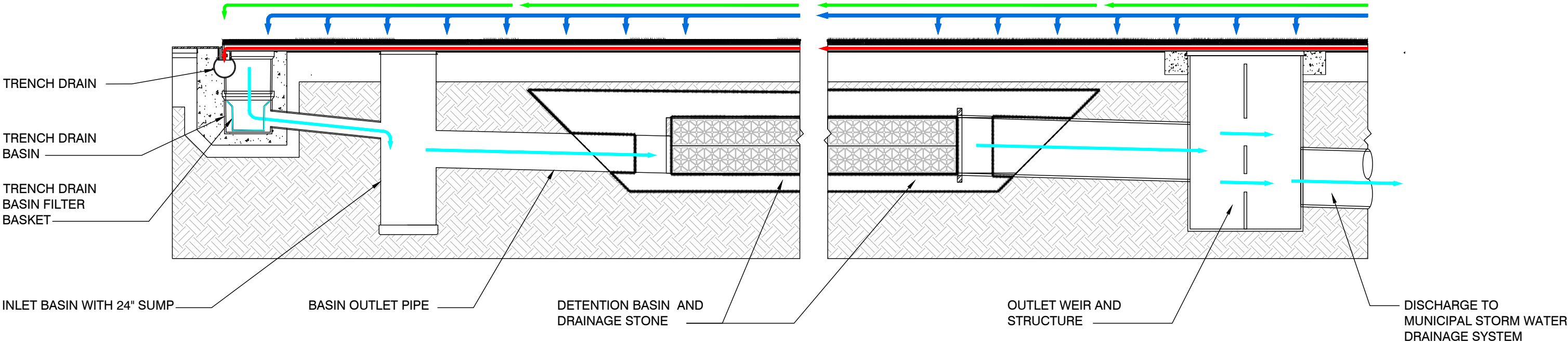


Typical site Storm Drainage Manholes

## Appendix 3

STORMWATER MANAGEMENT SYSTEM FLOW REGIMES:

- FIELD INFILTRATION FLOW
- FIELD SURFACE FLOW TO SLOT DRAIN
- FLOW WITHIN UNDERLAYMENT PAD
- FLOW WITHIN PIPING AND DETENTION SYSTEM



SYNTHETIC TURF STORMWATER MANAGEMENT SYSTEM DIAGRAM

## Appendix 4



# SPRINTURF®

## MAINTENANCE MANUAL

### SAFETY

#### SPRINTURF RULES

- Molded cleats or other athletic shoes only
- No sharp objects, including tent stakes, corner flags or other objects that can penetrate the surface of the field
- No food items
  - Including gum and sunflower seeds
- No tobacco products of any kind
- No sport drinks or liquids other than water
- No pets
- No bicycles or other unapproved vehicles
- Approved athletic equipment only

**SPRINTURF®**  
Synthetic Turf Systems  
1-877-686-TURF [www.sprinturf.com](http://www.sprinturf.com)

### PERFORMANCE



### SERVICE





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# **SPRINTURF**

## **MAINTENANCE MANUAL**

888-524-6017

## **Congratulations on the purchase of your new Sprinturf synthetic turf system and welcome to the Sprinturf family!**

At Sprinturf, customer delight is our number one goal and with every opportunity, we strive to ensure your complete satisfaction. It is important that you feel Sprinturf is a true partner and not just a vendor to your organization.

While this manual will provide a lot of valuable information, if at any time you have a specific question or concern about your new field, please do not hesitate to contact us directly at **888-524-6017**.

Your new Sprinturf sports field requires much less maintenance and significantly more playability than a natural grass field. In fact, many owners find that usage will double and often triple with the introduction of a Sprinturf field. Owners also recognize that shifting activities on-to their Sprinturf field will allow the natural grass fields a longer resting period than before which, in turn, keeps them in better shape as well.

While maintenance on a synthetic field is greatly reduced from that of natural grass, a Sprinturf synthetic turf system is not maintenance-free and will require a few hours of attention each week to keep it in pristine condition. This manual will provide simple steps to ensuring proper care and maintenance of your new field and offer tips for maximum playability.

For additional information, please visit the Sprinturf website at [www.sprinturf.com](http://www.sprinturf.com) or email customer care at [customercare@sprinturf.com](mailto:customercare@sprinturf.com)





# SPRINTURF®

## MAINTENANCE MANUAL

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## BREAK-IN PERIOD

Much like a fine leather product, your new Sprinturf field does have a normal break-in period of several months. The hours of play and amount of rainfall will impact the time it takes for the new infill to settle into the fiber system and provide optimum playing conditions.

1. Expect infill levels to drop during this time. This is considered normal compaction of the infill and is part of the system design.
2. Occasionally, dust may accumulate on the fiber due to environmental conditions or nearby construction. Both the fiber and infill will be naturally flushed clean during rainfall. This will also improve drainage capabilities of the turf system and typically clear the system of small debris.
3. The break-in period for your new field is much like that of a new carpet in your home. Use your approved groomer or sweeper on the field more regularly during the break in period to collect any loose fibers leftover from installation. Keep in mind that there are thousands of pounds of fiber on the field and loose fibers are abundant in the system from cutting that takes place during installation. Even after the break-in period, you will notice loose fibers during regular maintenance your field. This is normal and should be expected.





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## MAINTENANCE MANUAL

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## GROOMING THE FIELD

Grooming techniques are taught by a certified Sprinturf representative when your new Sprinturf field is completed. We highly recommend choosing one staff member to be responsible for the field maintenance and necessary equipment and for anyone who may groom to attend the training.

Liken your new Sprinturf field to that of carpet in your home. Cleaning debris from the field and using your Sprinturf-approved grooming equipment will help to keep your fibers standing tall and give the field a plush appearance. Always use a nylon, soft bristle drag system approved or designed by Sprinturf.

For a regulation size football field, grooming typically takes 2 hours and consists of driving a utility vehicle equipped with an approved drag brush attachment back and forth across the field to stand or "brush" the fibers in your system. For best results, grooming should be done during dry weather and when the field is dry to the touch.



### How often should you groom?

New fields should be groomed once a week for the first two months upon installation to remove excess or loose fibers. Following the break-in period, Sprinturf recommends grooming your field following approximately 100 hours of use or no less than once per month, whichever is first.

### Grooming a rectangular field

Proper grooming is dependent upon your field layout and should be done in the same direction as the seams to avoid excess wear on seam areas. For a field that is rectangular in shape, such as football, soccer, lacrosse or field hockey, groom the field from sideline to sideline, alternating the direction of travel as shown in the photo to the right.

**For example: Begin grooming in the direction of the home side and return towards the visiting side on successive grooming cycles.**



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### Grooming a baseball field

For a baseball or softball field layout, groom base paths beginning at home plate, moving to first base, second base, third base and back to the home plate area similar to the way an athlete would run the bases. Groom your outfield, foul areas and warning tracks as shown at right. If you are unsure on the directionality of your field, contact your Sprinturf Customer Care representative.

### Infill Displacement

In areas that receive significant and repetitive play such as goal mouths, foul lines, and penalty kick areas, you may notice that the infill will become displaced. This typically occurs over a long period of time in concentrated areas of the field due to kicking or other repetitive motions on the surface. If at any time the infill becomes displaced, simply brush it back into place using a medium stiff, nylon bristle brush to ensure an even playing surface with the remainder of the field.

It is important to monitor these high use areas on a regular basis to ensure that proper infill levels are maintained across the entire surface. Not only can an area low on infill damage the turf fiber and backing in the area from excessive wear and tear, but it may also present a safety hazard.

Infill displacement can also occur when using equipment such as a snow plow on the surface. While the plow is not intended to touch the surface during plowing, often times infill will inadvertently be picked up during the process. If this happens, simply brush or re-disperse the infill evenly onto the field once the snow has melted.



### Static Electricity

Static electricity is the accumulation of electrical charges on the surface of a material. It is most likely to form when the air is dry or the humidity is low. While it is not harmful, static can be an annoyance to athletes on the field. Find a remnant of your synthetic turf approximately 3' wide and 3-6' long and soak the piece in water until it's saturated. Attach the turf to your utility vehicle so that the fiber of the remnant and that of your surface are face to face. Drag it across your field as in a typical grooming pattern. Be sure to keep the piece of turf wet at all times to neutralize the charge (re-wet the turf roughly 5-6 times for a full size field). For extreme cases, a solution of 1 cup fabric softener to 5 gallons of water can also be used.

### Grooming after Special Events / Concerts / Graduation Ceremonies

It is a good practice to get in the habit of occasionally using a drag magnet on your field to catch debris such as bobby pins, earrings or other metallic items that may land on your field of play. These items are potential safety hazards and could cause a laceration or more serious injury if protruding from the surface.



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## APPROVED GROOMING EQUIPMENT

Typically, Sprinturf athletic fields are specified with an approved piece of grooming equipment. If your field was not specified with equipment or you are in need of replacing that which came with your field, Sprinturf recommends the following drag broom systems for regular maintenance of your field.

**Note: Sprinturf does not recommend the use of tines for our synthetic turf systems.**

If tines have been purchased or specified for your field, please consult your Sprinturf Customer Care manager for specific usage guidelines. Tines are typically recommended for systems with a high percentage of sand and therefore not needed for most Sprinturf fields. Overuse can cause unnecessary stress on the fiber system and will not improve upon the typical grooming process.

### Gandy<sup>®</sup> Sweep Master Turf Brush

<http://www.gandy.net/turfbrush.php3>



### GreensGroomer<sup>®</sup> Synthetic Sports Turf Groomer

<http://www.greensgroomer.com/synthetic>



### TC1400<sup>®</sup>

[http://www.smgequipment.com/product\\_p/tca1400.htm](http://www.smgequipment.com/product_p/tca1400.htm)



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Always use caution when putting any type of vehicle or equipment onto your field. Sharp turns, excessive speed and overweight vehicles can easily damage the surface. Sprinturf requires the use of turf tires on all vehicles used on the surface. All tires should be inflated to the manufacturer's recommended tire pressure, typically around 15-20 psi.

**No 6-wheeled vehicles are permitted.**

### **Club Car® - Carryall 295 (4 wheel models only)**

- Gas/Diesel
- Hitch
- Turf Tires



### **John Deere® Gator™ (4 wheel models only) Model # TS or TX**

- Gas/Diesel
- Hitch (pin)
- Turf Tires



### **Gas-Powered Golf Cart (any brand)**

- No battery powered vehicles
- Turf Tires
- Hitch (pin)





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## MAINTENANCE MANUAL

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## REMOVAL OF DEBRIS

It is important to keep your new Sprinturf field free of debris. Often times this can be done with a simple walk-through to pick up items such as discarded athletic tape. At other times, it may be necessary to utilize a sweeper. This is common, for example, if the surrounding area has a lot of trees and leaves fall onto the field of play on a regular basis.

1. A Sprinturf-recommended sweeper should be used to remove debris from the field as needed. Large articles of debris that may clog or damage the equipment should be picked up by hand prior to using the sweeper.
2. Sprinturf recommends sweepers provided by the following manufacturers:

### Parker<sup>®</sup>

<http://www.parkersweeper.com>

- a. Parker<sup>®</sup> Estate Master TurfSweeper EM83100M (100")
- b. Parker<sup>®</sup> Suburbanite TurfSweeper SU8336M (36")



### Agri-Fab<sup>®</sup>

<http://www.agri-fab.com>

- a. Agri-Fab<sup>®</sup> Tow Lawn Sweepers  
Model #45-0331 (38")  
Model #45-0320 (42")  
Model #45-0326 (46")
- b. Agri-Fab SmartSWEEP<sup>™</sup> 44"



3. When using a Sprinturf recommended sweeper, adjust the broom so that it makes minimal contact with the turf. If the broom is lowered too much, you run the risk of re-moving excessive amounts of infill and disturbing the integrity of the turf system. For this reason, Sprinturf only recommends using a sweeper with a mesh bottom basket to allow the infill mixture to fall back onto the field while picking up litter.
4. It is normal for small amounts of infill to be moved when sweeping the field. This infill is properly redistributed during the regular grooming process.

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## MAINTENANCE MANUAL

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## CLEANING A SPRINTURF FIELD

1. Regular cleaning of your field is not a required maintenance practice. Occasional rainfall will naturally clean your field of dust, pollen and other airborne particles that have settled on the field. Additional steps are not necessary unless a spill takes place.
2. Any spill of a foreign substance or bodily fluids should be removed as quickly as possible, using a solution of non-phosphorous detergent and water (3 ounces of anon-phosphorous detergent, such as Tide®, per 1 gallon of water).
3. Use the approved solution and a soft bristle broom or brush to clean the affected area of the turf.
4. Once the area is clean, flush using clean water to remove any residue from the solution.

### What if a large spill penetrates the turf system or a potentially toxic spill occurs (gasoline, motor oil, or hydraulic fuel)?

If a significant spill has penetrated the turf system or if a potentially toxic material is involved, removal of the infill in the affected area may be required. This can be done with an industrial wet/dry vacuum (i.e.: Shop-Vac®). If a spill of this type occurs, contact Sprinturf for further guidance on remediation efforts.

### How do I remove. . . ?

#### Lipstick, scuff marks, suntan lotion and pen ink

Using a light spray of WD-40® and a clean rag, scrub the area thoroughly. Once the stain is removed, rinse the area with clean water to remove any residue left from the solution.

#### Tar and/or asphalt

Scrape the area using a spatula-like tool and then clean using a sponge or soft bristle brush and if necessary, a light spray of WD-40. Once the stain is removed, rinse the area with clean water to remove any residue left from the solution.

#### Chewing gum

Use a surface coolant such as an athletic cold spray to first freeze the gum on the surface and then scrape using a spatula-like tool.

#### Animal Waste

Remove and dispose of the waste. Neutralize the area with a mixture of white distilled vinegar in an equal amount of water. Rinse thoroughly with water after removal.



## DISINFECTING YOUR SPRINTURF FIELD

If environmental conditions or external causes warrant disinfecting your synthetic turf field, Sprinturf recommends the use of disinfectant solutions manufactured by Pioneer® Athletics. Pioneer also provides several options and an antimicrobial solution as well.

Products can be purchased directly through your local Pioneer representative or by contacting Pioneer Athletics at **800-877-1500**.

## FIELD MARKINGS

While most sports lines will be permanently tufted or in-laid in your new field, there may be a need for additional or temporary markings which will require the use of a temporary paint application. For best results, Sprinturf recommends the use of Pioneer® Athletics line of removable synthetic turf paints.

### Temporary Paints

**Pioneer® GameLine™ Temporary Aerosol** - Ideal for a one game application. Acts similarly to a chalk application on a natural grass surface and can be used in temperatures below 40°F.

**Pioneer® GameLine™** - Lasts up to one week depending on traffic and weather conditions.

**Pioneer® SeasonLine™** - Lasts up to a full season



### General Guidelines

1. Apply field markings when the surface is dry and clean. This will allow the paint to more readily adhere to the polyethylene fibers.
2. Apply any temporary marking lightly and evenly for the best performance and the least impact on your synthetic turf surface.
3. For best results, paint should be applied when the air temperature is between 65°-85°F.
4. Sprinturf recommends having Pioneer's Blitz-GameLine Solution on hand before any application in case of accidental spills or mistakes. This will quickly and easily remove the temporary paint.

For additional details on painting your Sprinturf field, visit [www.syntheticurfpaint.com](http://www.syntheticurfpaint.com).





# SPRINTURF<sup>®</sup>

## MAINTENANCE MANUAL

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## REPAIRS

While your field is relatively maintenance-free, you may occasionally find a loose seam, hash mark or line in need of repair.

1. Report any repair necessary to your Sprinturf Customer Care manager. This allows Sprinturf to maintain a log of any repaired areas on the field that can be inspected by a Sprinturf representative during our next site visit to your facility.

**CUSTOMER CARE:**

(email) [customercare@sprinturf.com](mailto:customercare@sprinturf.com)

(phone) 888-524-6017

(fax) 843-284-8823

**ALL FORMS SHOULD BE EMAILED OR FAXED**

2. Minor repairs due to normal wear and tear may be corrected by the Owner's maintenance staff by following the procedures below. Minor repairs are defined as an unfastened area of less than 16" in length.
  - While lifting the unfastened edge of the repair, remove and collect the infill of sand and/or rubber that has migrated under the turf with a relatively clean shop vacuum. This will expose the now debris free, seaming tape that anchors the turf.
  - Using a caulking gun, apply a 1/2" (pinky sized) bead of adhesive to the seaming tape. The bead of glue should be applied approximately 1/2" from the edge of the seam to avoid excessive squeeze out.
  - Firmly press the unfastened edge of the turf into the adhesive along the seam. Apply a sandbag or other weight for 3 to 4 hours to ensure good adhesion.
  - Remove the sand bag and pour the collected infill from the shop vacuum directly to seam area. Work the infill into the grass blades with your fingertips. A stiff bristle broom may be used to finish the grooming and complete the repair.
  - Approved adhesives: Any product sent by a Sprinturf representative or available at Home Depot and other retailers, Loctite—PL Premium 3X in caulking tubes.
3. Larger areas of damage due to vandalism or other outside causes may require the use of a Sprinturf repair crew. Using the enclosed Field Diagram/Repair Request Form, provide as much detail of the repair area as possible—include pictures of the areas if possible. Once Sprinturf receives the request, your Customer Care Manager will contact you to schedule the repairs or recommend proper remediation steps.

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## MAINTENANCE MANUAL

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## SNOW REMOVAL

Snow removal is possible with your new synthetic turf field, however, extreme caution and proper operator training is required.

1. Any equipment used for snow removal must first be approved by Sprinturf.
2. To avoid significant rubber displacement or tears in the surface during the plowing process, Sprinturf requires the use of a PVC pipe attached to cover the blade as ***shown in the photo to the right.***
3. If using a snow plow, it is imperative that the blade is lifted enough so that it DOES NOT touch the surface during plowing. The plow blade with PVC attachment should be positioned on the surface gently using a properly adjusted hydraulic mechanism about ½" to 1" above the turf. Take care not to drag the plow directly across the surface which may result in rubber displacement, fiber removal or damage to the system.
4. Plow from the center of the field towards the sidelines; pushing snow into piles outside of the field of play, but if possible, not off of the turf area. Normal plowing activities will displace some rubber that will be noticeable as the snow melts. Simply brush the rubber back into the field of play and fill any areas that may seem low or uneven.
5. Snow removal with a plow may leave track marks on the surface due to the weight of the equipment. Once the field is dry, these can be brushed out with a brush or using your standard grooming equipment.
6. It is important that plowing takes place often during a snow fall to avoid more than a 2" accumulation on the turf at any time. For colder regions that receive large amounts of snow, please call your Customer Care manager for recommendations.
7. Remember, a small layer of snow will melt once the turf is exposed to sunlight. Use a shovel to clear a small area on the turf and the sun will begin the melting process almost immediately.
8. In extreme cases, ice can be removed by spreading a piled fertilizer grade urea over the field using a broadcast spreader at a rate of 100lbs per every 3,000 square feet. This treatment will be effective in temperatures between 15°F and 32°F and should melt up to 1" of ice per hour.



### DO NOT . . .

1. Use chains or studded tires under any circumstance.
2. Park equipment on the turf surface for any length of time.
3. Attempt to remove ice from the field with a plow.
4. Use ice melting agents such as rock salt or calcium chloride on your playing surface.

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## MAINTENANCE MANUAL

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## KEEP YOUR FIELD IN PRISTINE CONDITION

- Walk your field regularly and inspect it for any necessary repairs. Report and repair them right away.
- Encourage players to walk the field after each practice or game and simply pick up any trash or debris found on the field.
- Groom the field on a regular basis as outlined in this manual. This keeps the fibers standing tall and your field in optimal playing condition.
- Promote even wear on your field to avoid excessive use of specific areas such as goalmouths. If possible, alternate practices on different sections of the field.

**For example:** Due to the repetitive nature of the marching band, encourage practices to alternate from the home side to the visitor side. This will avoid excessive wear on hash marks and yard lines.

- Pay special attention to areas that get repetitive wear and when the infill looks low from displacement, brush in infill from higher surrounding areas to even out the level of infill.
- The warnings and recommendations in your Maintenance Manual are for your protection. Improper use of your Sprinturf field may void your warranty.



## Do **NOT** allow the following under any circumstance

- **Sunflower seeds or tobacco products**  
These products will become trapped in the infill system and are too large to evacuate properly and too small to be picked up by regular grooming.
- **Metal cleats or track spikes**  
Metal cleats and spikes are harmful to your surface and can cause premature wear and tear on the fibers and may even puncture the backing system.
- **Pressure washer systems**  
Using pressure washers will displace infill and can cause damage to the turf system.
- **Wire bristle brushes or brooms**  
These tools will damage turf fibers and cause premature wear of the surface area. Bristles may also come loose, leaving behind potentially dangerous debris.
- **Harsh chemicals, ammonia, bleach and similar products**  
These products are detrimental to your synthetic turf field and will void the manufacturer's warranty. If you are unsure about using a cleaning product on your field, consult your Sprinturf customer care manager before use.



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## MAINTENANCE MANUAL

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## SPRINTURF SUGGESTED RULES

Sprinturf has provided several "Sprinturf Rules" signs for your benefit and use. We recommend that these be placed at all entrances to create awareness and enforce compliance by all users of the field. If you do not have a Rules sign or would like to purchase additional signs, please contact Customer Care at **888-524-6017**.

### Sprinturf Rules of the Field

- Molded cleats or other athletic shoes only
- No sharp objects – including tent stakes, corner flags or other objects that can penetrate the surface of the field
- No food items – including gum and sunflower seeds
- No tobacco products of any kind
- No sports drinks or liquids other than water
- No pets
- No bicycles or unapproved vehicles
- Approved athletic equipment only



### Weekly Field Maintenance Checklist

Keep the field clean of debris at all times.

Place trash receptacles strategically around the field to encourage cleanliness.

Keep vehicles off of the surface as much as possible.

Control access to the field to avoid vandalism and improper use.

Report any damage or issues needing attention to Sprinturf immediately.

Post "Sprinturf Rules" signs at all entrances.



## CONTACT INFORMATION

146 FAIRCHILD STREET, SUITE 150, DANIEL ISLAND, SC 29492 • CUSTOMERCARE@SPRINTURF.COM • PHONE: 888-524-6017

**Project Name:** \_\_\_\_\_

**Site Address:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

	Name	Title	Phone
<b>* Primary Contact:</b>	_____	_____	_____

**Email Address:** \_\_\_\_\_

**Additional Contacts:** \_\_\_\_\_

**Email Address:** \_\_\_\_\_

\_\_\_\_\_

**Email Address:** \_\_\_\_\_

\*The Primary Contact should be the person that our Customer Service Representative can contact to coordinate any repair work or scheduled maintenance on your field.

	Name	Phone	Email Address:
<b>Athletic Director:</b>	_____	_____	_____

\_\_\_\_\_

**Facilities Director:** \_\_\_\_\_

\_\_\_\_\_

**Maintenance Director:** \_\_\_\_\_

\_\_\_\_\_





## REPAIR FORM FOOTBALL FIELD



		10	20	30	40	50	40	30	20	10	
		10	20	30	40	50	40	30	20	10	

**DIRECTIONS:** As accurately as possible, use an **X** to mark any areas in need of repair. For fields with multiple sports lines, it may also be necessary to use one of the configurations for other sports markings, on the following pages.

### CONTACT INFORMATION

**Today's Date:** \_\_\_\_\_

**Field or School Name:** \_\_\_\_\_

**Contact:** \_\_\_\_\_ **Title:** \_\_\_\_\_

**Site Address:** \_\_\_\_\_

**Cell Phone:** \_\_\_\_\_ **Office Phone:** \_\_\_\_\_

**Email Address:** \_\_\_\_\_

### DESCRIPTION:

☐

Field Under Warranty

☐

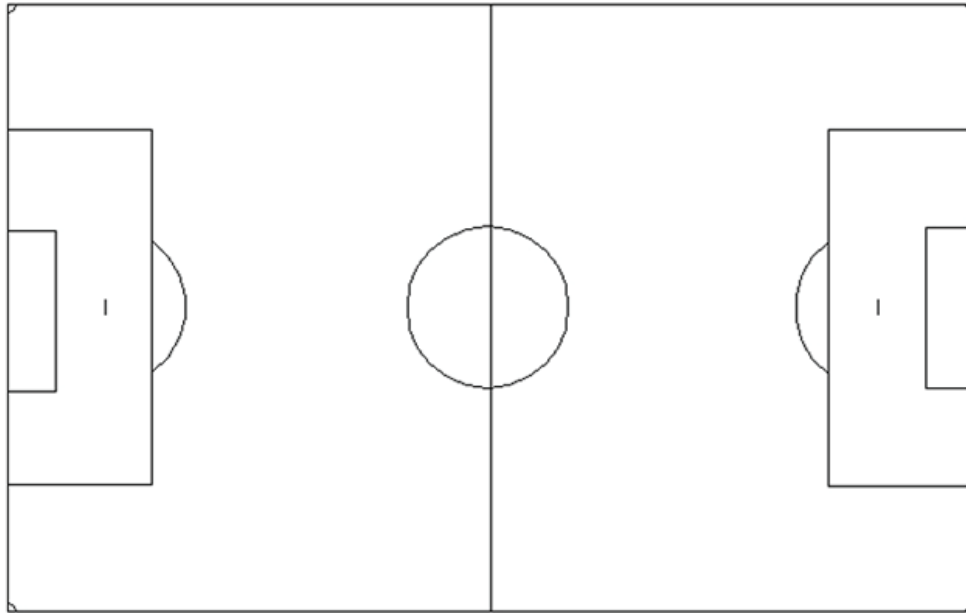
Own Attic Stock/Infill

**PLEASE ATTACH PHOTOS, IF AVAILABLE**

Email: [customer care@sprinturf.com](mailto:customer care@sprinturf.com) OR Fax: 843-284-8823 ATTN: Customer Care



## REPAIR FORM SOCCER FIELD



**DIRECTIONS:** As accurately as possible, use an **X** to mark any areas in need of repair. For fields with multiple sports lines, it may also be necessary to use one of the configurations for other sports markings, on the following pages.

### CONTACT INFORMATION

**Today's Date:** \_\_\_\_\_

**Field or School Name:** \_\_\_\_\_

**Contact:** \_\_\_\_\_ **Title:** \_\_\_\_\_

**Site Address:** \_\_\_\_\_

**Cell Phone:** \_\_\_\_\_ **Office Phone:** \_\_\_\_\_

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### DESCRIPTION:

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Field Under Warranty

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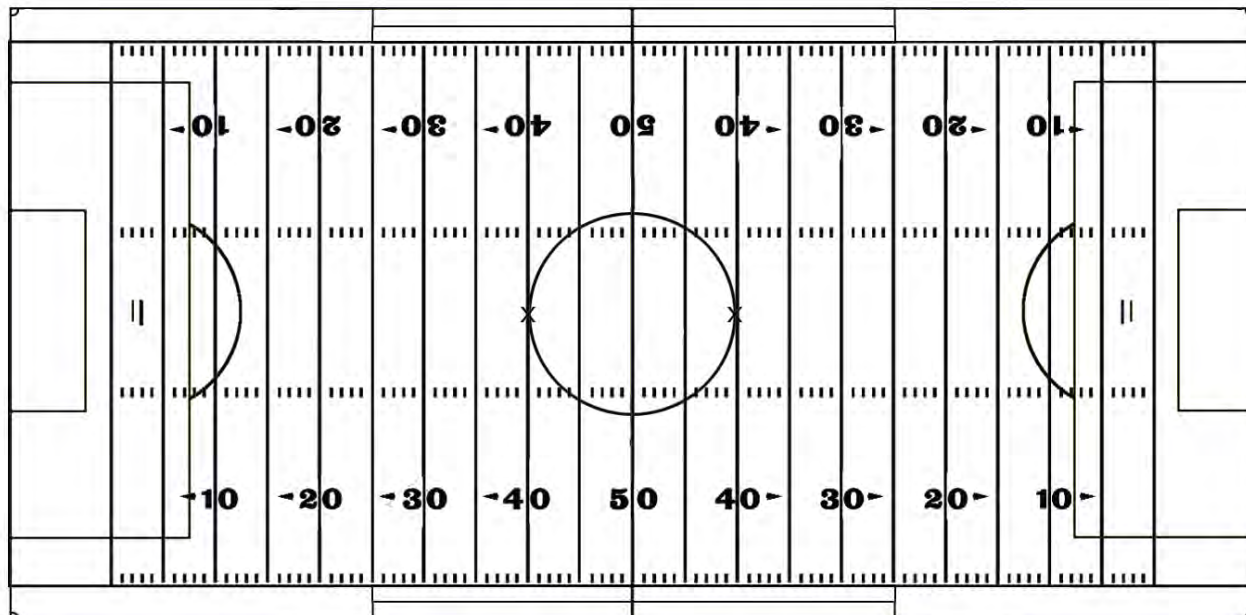
Own Attic Stock/Infill

**PLEASE ATTACH PHOTOS, IF AVAILABLE**

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# REPAIR FORM FOOTBALL / SOCCER FIELD



**DIRECTIONS:** As accurately as possible, use an **X** to mark any areas in need of repair. For fields with multiple sports lines, it may also be necessary to use one of the configurations for other sports markings, on the following pages.

## CONTACT INFORMATION

Today's Date: \_\_\_\_\_

Field or School Name: \_\_\_\_\_

Contact: \_\_\_\_\_ Title: \_\_\_\_\_

Site Address: \_\_\_\_\_

Cell Phone: \_\_\_\_\_ Office Phone: \_\_\_\_\_

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## DESCRIPTION:

☐ Field Under Warranty

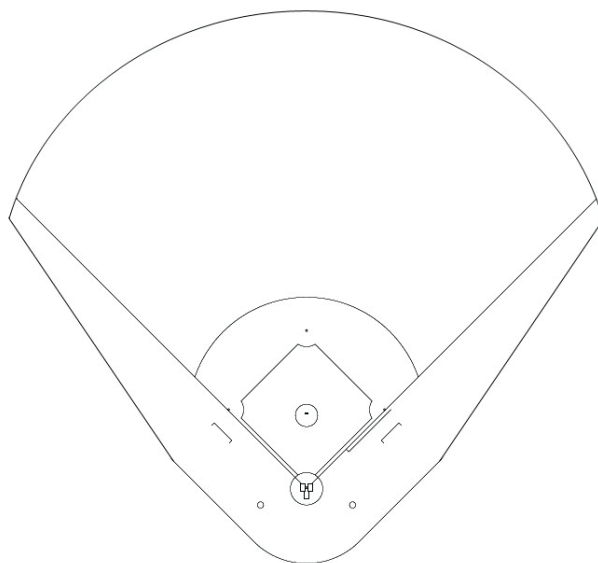
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**PLEASE ATTACH PHOTOS, IF AVAILABLE**

Email: [customer care@sprinturf.com](mailto:customer care@sprinturf.com) OR Fax: 843-284-8823 ATTN: Customer Care



## REPAIR FORM BASEBALL / SOFTBALL FIELD



**DIRECTIONS:** As accurately as possible, use an **X** to mark any areas in need of repair. For fields with multiple sports lines, it may also be necessary to use one of the configurations for other sports markings, on the following pages.

### CONTACT INFORMATION

**Today's Date:** \_\_\_\_\_

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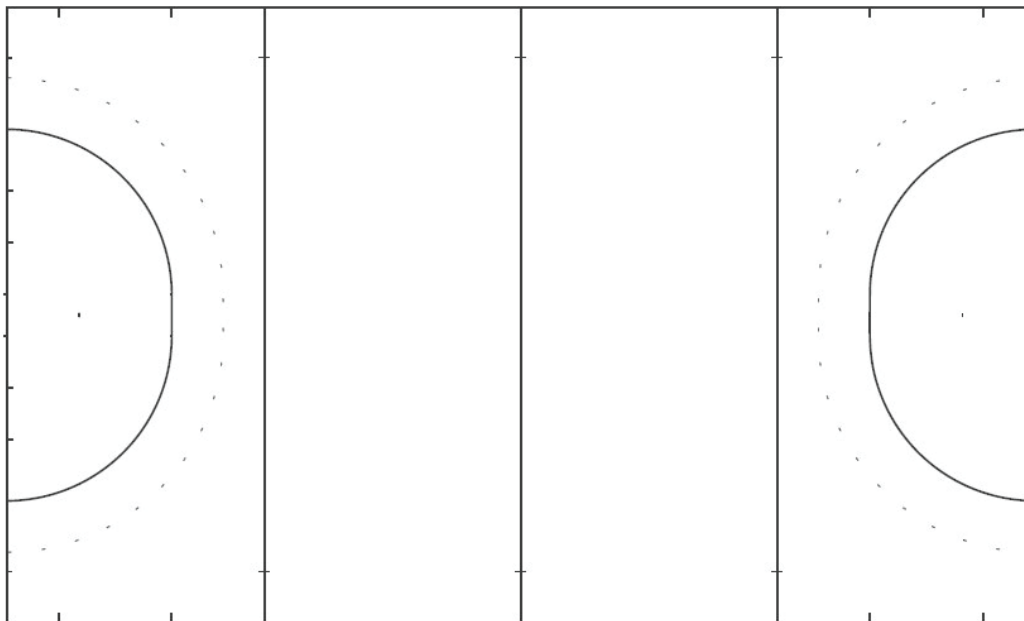
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Email: [customer care@sprinturf.com](mailto:customer care@sprinturf.com) OR Fax: 843-284-8823 ATTN: Customer Care



## REPAIR FORM FIELD HOCKEY FIELD



**DIRECTIONS:** As accurately as possible, use an **X** to mark any areas in need of repair. For fields with multiple sports lines, it may also be necessary to use one of the configurations for other sports markings, on the following pages.

### CONTACT INFORMATION

**Today's Date:** \_\_\_\_\_

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**Contact:** \_\_\_\_\_ **Title:** \_\_\_\_\_

**Site Address:** \_\_\_\_\_

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### DESCRIPTION:

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Field Under Warranty

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Own Attic Stock/Infill

**PLEASE ATTACH PHOTOS, IF AVAILABLE**

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## REPAIR FORM ADDITIONAL SPORTS LINES

### MEN'S LACROSSE


### WOMEN'S LACROSSE


**DIRECTIONS:** As accurately as possible, use an **X** to mark any areas in need of repair. For fields with multiple sports lines, it may also be necessary to use one of the configurations for other sports markings, on the following pages.



## ROUTINE MAINTENANCE LOG

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## SYNTHETIC TURF MAINTENANCE PROGRAM

A Sprinturf synthetic turf playing surface is one the best investments you can make to help ensure the safety of your athletes and meet the extreme usage demands of today's athletic facilities. While a Sprinturf synthetic field requires much less maintenance than an ordinary grass field, you, your athletes and your field will benefit from participating in the SprintCare Synthetic Turf Maintenance Program. With your participation in this program you have the peace of mind that your field will receive the proper care it needs to provide the maximum safety for your athletes. Additionally, the SprintCare Maintenance Program will help ensure your field lasts well past it's normal replacement cycle.

Note: Maintenance can only be performed in the spring and fall seasons.



### MAINTENANCE VISIT INCLUDES:

- 1 CLEAN & REDISTRIBUTE INFILL**  
Clean and redistributes infill evenly
- 2 FIELD BRUSHING**  
Brushing alleviates compaction and reinvigorates fibers
- 3 FIELD INSPECTION**  
Careful inspection of the field and remediation of seams, numbers or logos, if necessary
- 4 INFILL DEPTH TESTING**  
Infill depth testing with a remediation recommendation
- 5 WRITTEN REPORT**  
Detailed written report for owners record
- 6 GMAX TESTING**  
Gmax testing for field safety. (Available for additional cost)

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#### Manufacturing Facilities:

799 Industrial Drive  
Chatsworth, GA 30705

170 Rice Ave  
Dadeville, AL 36853

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## Appendix 5



# Technical Memorandum



**To:** Jeff Thielman, AHS Building Committee

**From:** John J. Amato, P.E.

**CC:** Lori Cowles, Arthur Duffy

**Date:** March 14, 2024

**Project:** Arlington High School – Order of Conditions Extension – Synthetic Turf Infill Material

**Title:** Concerns Regarding SBR Crumb - 6PPD and Transformation Product 6PPD-Quinone

## Introduction

During 2020, a team of researchers from University of Washington of Tacoma, University of Washington, and Washington State University Puyallup, prompted by the pre-spawning death of nearly 50% of the coho salmon returning to Puget Sound's urban area streams, started noticing that "after a big rain" salmon were dying before they could spawn ([McQuate et al., 2020](#)). This critical observation prompted a multi-agency undertaking to determine the cause of these pre-spawning deaths. Over the past two decades references indicate transport of toxic chemical contaminants via storm water has contributed to the well documented urban stream syndrome ([Walsh et al., 2005](#)). This event represents the "recurring die-off of adult coho salmon that return from the ocean to spawn each year in large metropolitan areas of northern California, western Oregon, and Washington in the USA" ([Spromberg et al., 2015](#)).

According to their report published in Science 371, 175-189 (2021) and many other research papers published since that date, the cause was an indirectly generated transformation product resulting from a tire antioxidant compound, an antioxidant intended to protect the tires from oxidation N-(1,3-Dimethylbutyl)-N'-phenyl-p-phenylenediamine (6PPD) ([Prosser et al., 2023](#)), and ground ozone. The 6PPD used in tire manufacturing is distributed uniformly throughout the full mass of the tire at a concentration ranging from 0.2% to 4% of the tire's mass. Ground ozone, not to be confused with the upper atmosphere ozone, is created by oxides of nitrogen (NOx) and volatile organic compounds (VOCs) in the presence of ultraviolet light and heat ([US EPA Ground-level-Ozone Basics](#)). The mixture of NOx and VOC are major components of smog typical of major highways. The tire component of this reaction consists of tire abrade, a very fine roadway wear by-product in the micro-plastic size range of 0.0003937 inch (1 micron) to 0.03937 inch (1,000 micron) ([Federal Institute of Hydrology et al., 2020](#)). Add sunlight, heat, ozone, and the tire antioxidant 6PPD is transformed into 6PPD-Quinone.

## Context

Tire abrade, both with 6PPD and the transformed product 6PPD-Quinone, sit on the highways until a large enough rainstorm event washes these materials into the surrounding stormwater drainage system and subsequently into the receiving waters. Very sensitive fish such as juvenile coho salmon are subject to mortality syndrome at LC50 of 41ng/L of 6PPD-Quinone (95% Confidence limit: 31.6-48.5 ng/L) ([Lo et al., 2023](#)). LC50, representing the concentration of a contaminant that is predicted to cause 50% mortality. In this same report juvenile Chinook are noted as being on the order of magnitude of 3 times less sensitive than juvenile coho salmon. The LC50 for other known sensitive fish species are listed in table contained in a report entitled Acute Toxicity of 6PPD-Quinone to Early Life Stage Juvenile Chinook (*Oncorhynchus tshawytscha*) and Coho (*Oncorhynchus kisutch*) Salmon ([Lo et al., 2023](#)).

Most fish considered sensitive to environmental contaminants are not as sensitive to 6PPD-Quinone as coho salmon. Brook trout and rainbow trout two years in age, were exposed to 6PPD-Q and showed signs of gasping, spiraling, and loss of equilibrium before death, which was a typical condition after prolonged exposure. ([Brinkmann et al., 2022](#)). Brook trout with LC50 of 590 ng/L and rainbow trout with LC50 of 1960 ng/L ([Brinkmann et al., 2022](#)) for example are 10 and 20 times less sensitive than coho salmon juveniles, respectively. These two trout species are far hardier species than the coho salmon juveniles. Hardier species such as Arctic char and white sturgeon resulted in no morbidities up to 96 hours ([Brinkmann et al., 2022](#)).



Fish Species	Concentration	Unit	Conversion	Unit	Conversion	Unit
Coho Salmon - <i>Oncorhynchus kisutch</i> LC50 (Tian 2020)	0.79	µg/L			790	ng/L
Coho Salmon - <i>Oncorhynchus kisutch</i> LC50 (Tian 2020) Juvenile 1+ Year					95	ng/L
Coho Salmon - <i>Oncorhynchus kisutch</i> LC50 (Tian 2022) Juvenile - 3 Weeks					95	ng/L
Coho Salmon - <i>Oncorhynchus kisutch</i> LC50 (Lo 2023) Juvenile - 3 Weeks					41	ng/L
Brook Trout - <i>Salvelinus fontinalis</i> (Brinkmann 2022) Juvenile - 1 Year	0.59	µg/L			590	ng/L
Rainbow Trout - <i>Oncorhynchus mykiss</i> (Brinkmann 2022) Juvenile - 2 Year	1.96	µg/L			1,960	ng/L

Table 1: Selected LC50 24 hour for selected fish species referenced for noted studies

During 2015, prior to the 2020 determination that 6PPD-Quinone was the cause of salmon mortality syndrome, Julann Stromberg published a paper entitled “Coho Salmon Spawner Mortality in Western US Urban Watersheds: Bioinfiltration Prevents Lethal Storm Water Impacts” which analyzed impacts associated with exposures to artificial storm water, exposure to highway runoff, and exposure to filtered runoff. The highway runoff was collected from downspouts of an elevated 70 meter wide four lane highway with approximately 60,000 vehicles per day load and a concrete pavement surface. At the time Stromberg believed that the contamination was a combination of heavy metals, PAH's and vehicle oils and fluids. Through their work they determined that controlled exposures to untreated urban run-off were sufficient to reproduce the coho spawner mortality syndrome. Under untreated highway runoff conditions, adult coho salmon had a 100% mortality rate. All adult coho salmon exposed to treated highway runoff survived and showed no symptoms. This treatment consisted of a filter system of layered gravel, bioretention media, and mulch (Spromberg et al., 2015). The solution arrived at during the 2015 study is the same solution currently being recommended by today's researchers.

A study published in 2020 with the goal of determining the cause of urban runoff mortality syndrome, which did identify 6PPD-Q as being the primary cause of urban runoff mortality syndrome, looked at ground tire rubber as a possible source. Initial testing performed by Zhenyu Tian exposed coho salmon to ground tire wear particle leachate at a concentration of 250mg/L of a combination using a blend of 50:50 new and used tires. This effort was an important step in determination of this environmental contaminant. The test on juvenile coho salmon resulted in a 98.5% mortality in 135 tested fish. Subsequent to this preliminary test, and as part of the same study, it was determined that testing of juvenile with exposure to sampled roadway runoff from Seattle-region roadway runoff and ozone synthesized 6PPD-quinone resulted in coho LC50 of 0.82ug/L of 6PPD-Quinone (95% Confidence limit: 0.55, 1.1 ug/L) and 0.79µg/L of 6PPD-Quinone (95% Confidence limit: 0.63, 0.96 µg/L) respectively (Tian et al., 2022). These values converted to nanograms per liter for comparison to the LC50 values above are: LC50 of 820ng/L of 6PPD-Quinone (95% Confidence limit: 550, 1,100 ng/L) and 790ng/L of 6PPD Quinone (95% Confidence limit: 630, 960 ng/L) respectively.

### Public Concern Regarding the Use of SBR Crumb and 6PPD

In the past several years a possible connection has been made to styrene butadiene rubber (SBR) crumb (repurposed tire crumb rubber) used in most infill synthetic turf fields and the tire abrade noted above. Although the source of tire abrade and SBR crumb used as a synthetic turf infill material are generally the same, in reality they are very different in characteristics and composition. Tire abrade has an extremely fine particle size in the micro-plastic range, 0.00004 inch (1 micron) to 0.039 inch (1,000 micron) (Federal Institute of Hydrology et al, 2020). Styrene butadiene rubber (SBR) crumb used as a synthetic turf infill material has a particle size of 1.00 mm (0.039 inch) to 2.36 mm (0.093 inch) (Source CRM Crumb Rubber Specification and Sieve Analysis submitted for AHS).

Beyond these physical characteristics, the environments in which tire abrade and SBR crumb are placed create conditions that behave very differently. Tire abrade, after it is generated by roadway wear will remain in place on the pavement surface until washed into the surrounding receiving environment during the next major rain event. The larger the rain event, the more likely removal of the abrade will behave as a first flush for contaminants. First flush events are significant enough to remove most contaminants from pavement resulting in the contaminant shocking of sensitive fish species. While the abrade sits on the pavement surface awaiting these rain events it is exposed to sunlight, heat, ground ozone, and the tire antioxidant 6PPD within the abrade is transformed into 6PPD-Quinone. According to sample testing and associated studies performed after snow events it had determined that 90% to 99% of the 6PPD and 6PPD-Quinone leaves the pavement and enters the receiving environment as tire abrade containing 6PPD and 6PPD-Quinone, and not in liquid form (Seiwert et al., 2022). Plowing of snow allows build-up of snow-banks highway edges and accumulates tire abrade which is eventually washed away in snowmelt waters. According to Yale 360 Environment Road Hazard: Evidence Mounts on Toxic Pollution from Tires, "These fragments are ingested by marine animals - particles have been found in gills and stomachs - and can cause a range of effects, from neurotoxicity to growth retardation and behavioral abnormalities" (McIntyre et al., 2023). Individuals that successfully spawn commonly do so in shallow, low-lying streams where elevated levels of stormwater contaminants can persist for hours or days with high peak contaminant concentrations (Peter et al., 2020).

A critical physical characteristics that should be taken into account when comparing tire abrade on highways to SBR crumb infill in synthetic turf fields is stormwater runoff behavior of these differing systems. Highways and their smooth surfaces are designed with cross-slopes of 0.02 ft/ft (2%) in order to allow rainwater to exit the paved surface quickly. In the case of highways, the slope and paved type surface, with a typical cross-slope of 0.02 ft/ft results in a runoff velocity of 1.2 ft/sec, 1 ft/sec being considered a minimum scouring velocity. Synthetic turf fields and their dense synthetic pile are designed to play similar to natural turf grass have cross-slopes of less than 0.01 ft/ft (1%) which limits the impact that surface slopes have on athletic play and performance. This cross-slope of 0.01 ft/ft coupled with the addition of the dense fiber would result in a surface runoff velocity of 0.05 ft/sec. At this velocity scouring is not possible and migration of very fine particles is very unlikely especially with the presents of the fiber matrix. The paved highway runoff velocity is 24 times greater than that of the synthetic turf surface. This comparative analysis was generated using HydroCAD Stormwater Modeling under sheet flow conditions.

## Potential Treatment Solutions

Untreated runoff from freeways, highways, major roads, and paved lots represents a significant, and growing threat to Pacific salmon conservation efforts. Given the particle size of the tire abrade a sand filter placed between the road pavement surface and the receiving environment would effectively reduce the concentration of any pollutant entering the environment. A vegetative grass filter may also provide the necessary filtering to reduce the impact of tire abrade on the environment. Simple and inexpensive bioinfiltration solutions have been evaluated to reduce the bioavailability and corresponding toxicity of contaminants in conventional urban runoff to coho salmon early life stages (McIntyre et al., 2023) and adults (Spromberg et al., 2016)

The evolution of low impact bioretention systems introduced in the 90's is currently on-going. A study demonstrated that they were effective for removing oil, grease, nutrients, nitrogen, phosphorus, and other primary concern for the protection of aquatic ecosystems. At the time it was noted that these low impact solutions lacked construction quality control, soil mixtures were less than ideal for the intended purpose, and vegetative development was poor. These conditions impacted both contaminant removal and hydraulic performance. Several improvements which resulted in improved performance were provided as part of this study. They included; the addition of a low permeability layer below a higher permeability layer in bioretention soil media to promote nitrification and denitrification processes, proper separation between the mitigative measure and groundwater, improved vegetative coverage and maintenance, and the potential inclusion of separation membranes where contamination of groundwater was a concern (Roy-Portier et al., 2010).

A literature review was undertaken to determine the effectiveness of low impact development technologies that were implemented over the previous two decades. These studies determined that from a hydraulic perspective these technologies perform well but follow up on water quality performance was lacking. (Sprackmann et al., 2020). In the efforts to develop a potential mitigative solution to the 40% to 90% mortality rate of coho salmon returning to creeks and rivers of the U.S. Northwest Pacific regions, evaluation of full scale bioretention cell was undertaken. The tested full size mockup of the bioretention basin consisted of an unlined bottom surface, a crushed stone drainage layer with perforated collection pipes, a 45 cm sand filter media thickness, all covered by 15cm of mulch. The system was designed to provide for 15 cm of ponding above the mulch. These large scale tests spiked water with liquid 6PPD-Q upstream of the bioretention basin and sampled taken from subsurface perforated drainage piping. This study did not look at the effectiveness of the treatment of tire abrade with 6PPD-Q suspended in the bioretention system inflow waters. 28 samples were taken at a frequency of 5 to 20 minutes between samples with a total sample count of 28. This research demonstrated that stormwater bioretention systems could reduce synthetic 6PPD-Q stream loadings by greater than 90%. (Rodgers et al., 2010).

### Material and Design Considerations

SBR crumb used in infilled synthetic turf fields, as noted above, consists of larger size particles. In addition to the size difference the particles are placed within a matrix of polyethylene fibers and not sitting on a smooth surface. In the AHS design the synthetic turf field cross-section includes an impermeable liner on the bottom, a premolded resilient drainage pad above the liner, a 2.0 inch fiber perforated carpet and backing system, a 3/4 inch layer of filter sand, and it is topped with a thin 1/2 inch layer of SBR crumb. The sand and SBR crumb layer are placed within the fiber matrix. The combination of the resilient pad and the 2.0 inch fiber allows for a thinner SBR crumb layer above the sand, exposing less of the SBR and additional exposed fiber length to allow improved infill flyout reduction and reduced down gradient flow of particles.

The system as designed provides multiple levels of protection from discharges of 6PPD-Quinone to our receiving environment. The first level is that most synthetic turf fields, as does the AHS field system, include a sand ballast layer which acts as a sand filter layer between the SBR crumb and the perforations in the backing system which provides filtering of during the majority of storm events.

Second, down gradient of the field section all runoff to the surface slot drains and flow infiltrated into the drainage pad channels enters the trench drain system which includes a series of catch basins equipped with stainless steel filter baskets to allow for a second level of infill migration control.

The third level of protection to the environment is inherent in the 6PPD transformation reaction compound requirements. As noted previously ground ozone is created by the interaction of oxides of nitrogen (NOx) and volatile organic compounds (VOCs) in the presence of ultraviolet light and heat. The missing element of this cocktail is NOx which are a pollutant group "released to the air from the exhaust of motor vehicles, the burning of coal, oil, or natural gas, and during processes such as arc welding, electroplating, engraving, and dynamite blasting" (U.S. Department Of Health And Human Services). Transformation into 6PPD-quinone is not generally possible without vehicle pollution.

The fourth level of protection from discharges inherent in the system is that if NOx became available due to some significant increase in vehicle pollution or change in prevailing winds adequate to convert 6PPD into 6PPD-quinone the matrix of fibers would shadow the SBR crumb and reduce the ability of ultraviolet light penetration into the SBR crumb and reduce the likelihood of a transformation. This condition is further reduced in that the physical size difference in the larger SBR crumb particles over that of much smaller tire abrade is such that larger particle has significantly less available surface area upon which the ozone and ultraviolet light could react.

The final element of the system as designed is that the subsurface detention chambers over 12 feet wide within the void chamber which provides for a very wide, less deep, and much slower flow regime within the chambers further reducing impacts to the environment by allowing for improved internal settling of fine particles.

## Conclusions

The comparison of tire abrade to SBR crumb use in playing fields appears at first pass to have many similarities, but they end at the product source and the molecular composition level. These two synthetic rubbers experience very different conditions during their tire product after grinding life cycle.

The size range of the particles, how they are exposed to the compounds and conditions necessary to transform 6PPD into 6PPD-quinone, the conditions of their placement, and the conditions of their potential migrations are worlds apart. Tire abrade is generated on highway road surfaces by the road wear of tires, laid down on a smooth scouring level sloped surfaces, subjected to sunlight and high heat, rapidly washed into receiving environments where water bodies are contaminated. Basically, highways are specifically designed, unintentionally, to specially accomplish roadway wear, the fine abrade product storage, high exposure to ozone, and final discharge into the receiving environment to create the morbidity syndrome ending the lives of pre-spawning coho salmon. The AHS field on the other hand has been designed to control migration of fine SBR crumb particles to the extent possible, by setting surface slopes and system velocities which lower the likelihood of particle migration, utilizing denser fiber matrix which will trap particles and reduce ultraviolet exposure, providing filter baskets to intercept migrating particles before they enter the subsurface chambers, and by providing low height wide chambers to improve any additional particle settlement that may take place. Synthetic turf fields with SBR crumb have a high level to potential to reduce these deadly conditions.

The AHS playing field system has been designed to obtain the best possible outcomes from a quality of play and an environmental impact perspective. The reduction of the potential for particle migration into Mil Brook reduces potential contamination and sets SBR crumb apart from tire abrade.

## References:

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## Appendix 6

## Arlington High School Building Committee Members

**Jeff Thielman**

School Committee  
Arlington High School Building Committee Chair

**Dr. Elizabeth Homan**

Superintendent, Arlington Public Schools  
Arlington High School Building Committee Co-Vice Chair

**Jim Feeney**

Town Manager  
Arlington High School Building Committee Co-Vice Chair

**Dr. Kirsi Allison-Ampe**

School Committee

**Francis Callahan**

Community Member

**John Cole**

Community Member (former Permanent Town Building Committee member)

**Tobey Jackson**

Community Member

**Matthew Janger**

Arlington High School Principal

**Ryan Katofsky**

Community Member

**Kate Loosian**

Community Member

**Bill McCarthy**

Arlington High School Assistant Principal

**Michael Mason**

Assistant Superintendent of Finance and Operations

**Judson Pierce**

Community Member

**Alex Magee**

Deputy Town Manager/Finance Director

**Amy Speare**

Community Member

**Rob Behrent**

Facilities Director





## **Town of Arlington, Massachusetts**

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### **19 Sheraton Park Certificate of Compliance.**

#### **Summary:**

19 Sheraton Park Certificate of Compliance.



## Town of Arlington, Massachusetts

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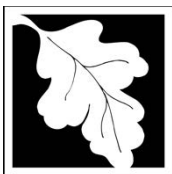
### Request for Determination of Applicability: 36 Peabody Road (Continuation from 3/21/2024).

#### Summary:

This public hearing will consider a Request for Determination of Applicability for an addition to the existing structure at 36 Peabody Road in Arlington along with landscaping and hardscaping activities within the 100-foot Buffer Zone and Adjacent Upland Resource Area to Spy Pond.

#### ATTACHMENTS:

Type	File Name	Description
▢ Reference Material	36_Peabody_Road_-_Request_for_Determination_of_Applicability_Package.pdf	36 Peabody Road - Request for Determination of Applicability Package



Massachusetts Department of Environmental Protection  
Bureau of Water Resources - Wetlands

# WPA Form 1- Request for Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Municipality

## A. General Information

**Important:**

When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



1. Applicant:

Eliza

First Name

Hatch

Last Name

36 Peabody Road

Address

Arlington

City/Town

MA

State

02476

Zip Code

978-852-0672

Phone Number

eliza.hatch@gmail.com

Email Address

2. Property Owner (if different from Applicant):

First Name

Last Name

Address

City/Town

State

Zip Code

Phone Number

Email Address (if known)

3. Representative (if any)

First Name

Last Name

Company Name

Address

City/Town

State

Zip Code

Phone Number

Email Address (if known)

## B. Project Description

1. a. Project Location (use maps and plans to identify the location of the area subject to this request):

36 Peabody Road

Street Address

Arlington

City/Town

42.41111

Latitude (Decimal Degrees Format with 5 digits after decimal e.g. XX.XXXXX)

-71.15600

Longitude (Decimal Degrees Format with 5 digits after decimal e.g. -XX.XXXXX)

121

Assessors' Map Number

121-2-10

Assessors' Lot/Parcel Number

b. Area Description (use additional paper, if necessary):

Backyard of 36 Peabody Road

c. Plan and/or Map Reference(s): (use additional paper if necessary)

Title

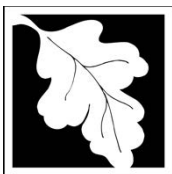
Date

Title

Date

[How to find Latitude and Longitude](#)

[and how to convert to decimal degrees](#)



## WPA Form 1- Request for Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Municipality \_\_\_\_\_

### B. Project Description (cont.)

2. a. Activity/Work Description (use additional paper and/or provide plan(s) of Activity, if necessary):

See Appendix A.

- b. Identify provisions of the Wetlands Protection Act or regulations which may exempt the applicant from having to file a Notice of Intent for all or part of the described work (use additional paper, if necessary).

See Appendix B.

3. a. If this application is a Request for Determination of Scope of Alternatives for work in the Riverfront Area, indicate the one classification below that best describes the project.

- ☐ Single family house on a lot recorded on or before 8/1/96
- ☐ Single family house on a lot recorded after 8/1/96
- ☐ Expansion of an existing structure on a lot recorded after 8/1/96
- ☐ Project, other than a single-family house or public project, where the applicant owned the lot before 8/7/96
- ☐ New agriculture or aquaculture project
- ☐ Public project where funds were appropriated prior to 8/7/96
- ☐ Project on a lot shown on an approved, definitive subdivision plan where there is a recorded deed restriction limiting total alteration of the Riverfront Area for the entire subdivision
- ☐ Residential subdivision; institutional, industrial, or commercial project
- ☐ Municipal project
- ☐ District, county, state, or federal government project
- ☐ Project required to evaluate off-site alternatives in more than one municipality in an Environmental Impact Report under MEPA or in an alternatives analysis pursuant to an application for a 404 permit from the U.S. Army Corps of Engineers or 401 Water Quality Certification from the Department of Environmental Protection.

- b. Provide evidence (e.g., record of date subdivision lot was recorded) supporting the classification above (use additional paper and/or attach appropriate documents, if necessary).



# Massachusetts Department of Environmental Protection

Bureau of Water Resources - Wetlands

## WPA Form 1- Request for Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Municipality \_\_\_\_\_

### C. Determinations

1. I request the Conservation Commission make the following determination(s). Check any that apply:  
Conservation Commission

- ☐ a. whether the **area** depicted on plan(s) and/or map(s) referenced above is an area subject to jurisdiction of the Wetlands Protection Act.
- ☐ b. whether the **boundaries** of resource area(s) depicted on plan(s) and/or map(s) referenced above are accurately delineated.
- ☐ c. whether the **Activities** depicted on plan(s) referenced above is subject to the Wetlands Protection Act and its regulations.
- ☐ d. whether the area and/or Activities depicted on plan(s) referenced above is subject to the jurisdiction of any **municipal wetlands' ordinance** or **bylaw** of:

\_\_\_\_\_  
Name of Municipality

- ☐ e. whether the following **scope of alternatives** is adequate for Activities in the Riverfront Area as depicted on referenced plan(s).
- \_\_\_\_\_

### D. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Request for Determination of Applicability and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge.

I further certify that the property owner, if different from the applicant, and the appropriate DEP Regional Office were sent a complete copy of this Request (including all appropriate documentation) simultaneously with the submittal of this Request to the Conservation Commission.

Failure by the applicant to send copies in a timely manner may result in dismissal of the Request for Determination of Applicability.

Signatures:

I also understand that notification of this Request will be placed in a local newspaper at my expense in accordance with Section 10.05(3)(b)(1) of the Wetlands Protection Act regulations.

\_\_\_\_\_  
Signature of Applicant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Representative (if any)

\_\_\_\_\_  
Date

## Appendix A

We plan to repair one wall that is failing due to improper installation. We are adding additional retaining wall to address ongoing erosion and to create a more stable planting area because the things we planted in that area did not survive. We are relocating one staircase to accommodate an upcoming planned addition to our house. We will be adding a total of thirty-four (34) square feet of hardscape (see attached plans for details). As part of the work on the house we plan to remove brick pavers, though this is slightly outside of the resource area.

In order to do this, we plan to install erosion controls at the base of the steepest part of the hill, as we are trying to reduce overall erosion on our property. We plan to remove one 14" Sycamore Maple and one 12" Norway Maple which shows signs of the trunk failing at the base of the tree. We plan to replace them with four native trees per the replacement requirements. We also will be moving one native tree that we installed in 2020 just inside the 100' buffer zone and replanting it in a slightly different location just outside of the 100' buffer zone. Lastly, we plan to install approximately ten new native shrubs once work on the walls and staircase is complete. It is our hope that these shrubs and replacement trees will help to stabilize this last section of hillside.

## Appendix B

This project qualifies for Conservation Agent Administrative Review under the Arlington Regulations for Wetlands Protection Section 8.

Section 8(B) states that the Applicant may apply for Administrative Review if the project meets the criteria of Sections 8(C) and 8(D).

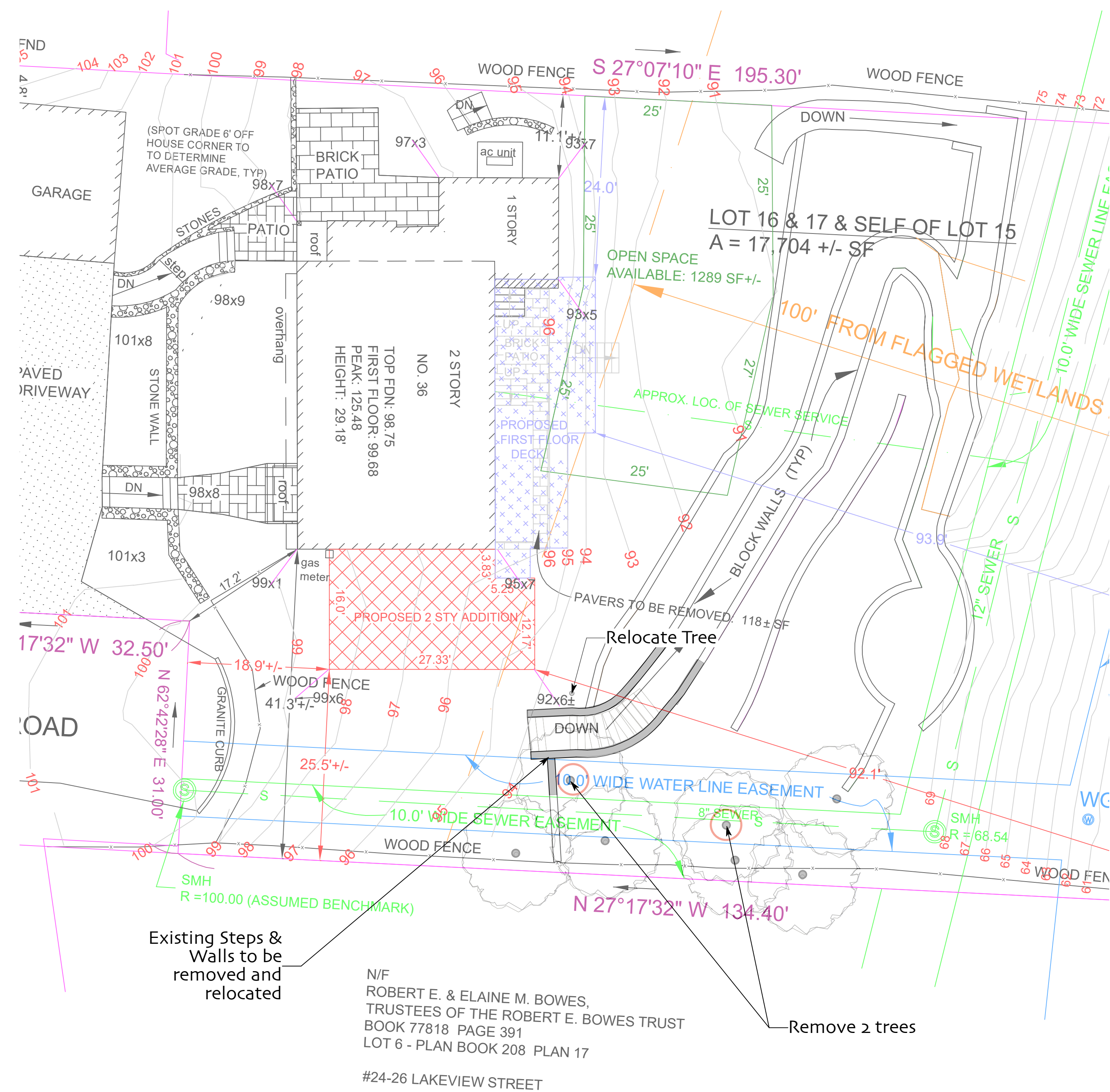
### *Section 8(C):*

- (1) The work is proposed only in the Adjacent Upper Resource Area (AURA).
- (2) The work is going to be significantly less than 5,000 square feet.
- (3) The work will not be in the first 25 feet of the AURA, with the exception of our plan to install appropriate erosion controls.
- (4) We do not plan to remove non-invasive vegetation. We plan to remove two trees but plan to replace them with four additional and more appropriate trees from the native plant list.
- (5) The work will not adversely impact climate change resilience functions. In fact, we hope that by stabilizing the steepest part of our hillside more we will be able to replant several native shrubs that did not survive the drought a few years ago as well as prevent further erosion into Spy Pond.

### *Section 8(D):*

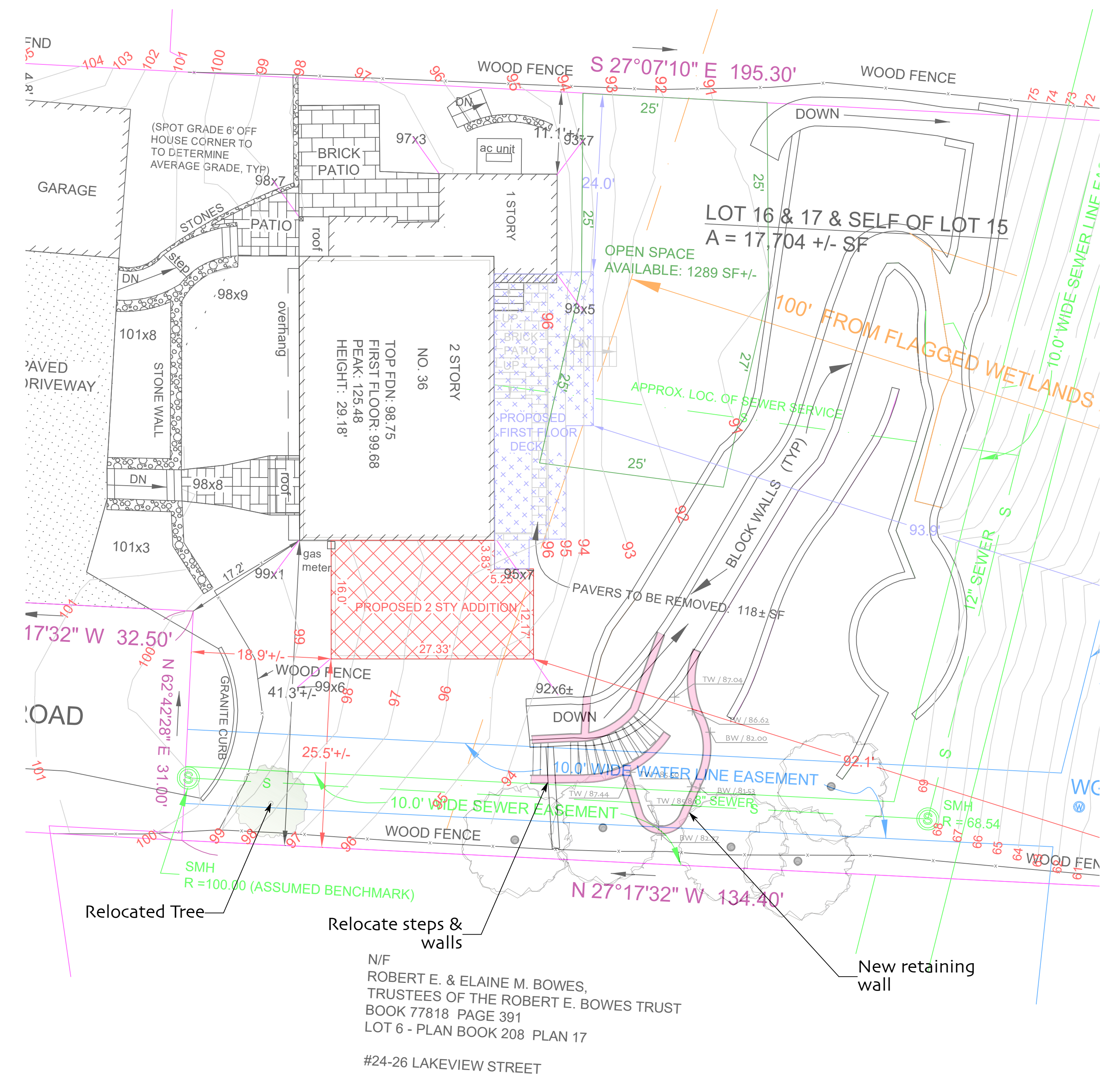
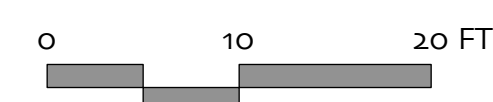
- (2) Installation of a short stretch of new stone wall; repair of existing wall/staircase, and a slight relocation of a staircase. The sides of the staircase, especially the freestanding one, will likely need mortar in order to withstand the pressure of the steep slope, but the remaining walls will be freestanding.
- (4) We plan to install approximately ten additional native shrubs once the walls are repaired/installed.





EXISTING CONDITIONS/DEMOLITION  
54 SF Walls to be removed

54 SF Walls to be removed



## PROPOSED PLAN

88 SF Walls to be added

88-54= 34 SF Total Additional Hardscape





## **Abutter Notification**

### **Notification to Abutters Under the Massachusetts Wetlands Protection Act And Arlington Wetlands Protection Bylaw**

In accordance with the second paragraph of Massachusetts General Laws Chapter 131, Section 40, and the Arlington Wetlands Protection Bylaw, you are hereby notified of the following:

The Conservation Commission will hold a virtual public meeting using Zoom, on Thursday, March 21, 2024, at 7:00pm in accordance with the provisions of the Mass. Wetlands Protection Act (M.G.L. Ch. 131, s. 40, as amended), the Town of Arlington Bylaws Article 8, Bylaw for Wetland Protection, and in accordance with the Governor's Order Suspending Certain Provisions of the Open Meeting Law, G. L. c. 30A, § 20 relating to the COVID-19 emergency, for a Request for Determination of Applicability from Eliza Hatch and Ian Jessen, for repairing walls, adjusting placement of staircase, moving/replacing trees at 36 Peabody Road, Arlington, MA 02476, within 100 feet of a wetland, on Assessor's Property Map/s #121, Lot/s #121-2-10. Please refer to the Commission's online meeting agenda for specific Zoom meeting access information.

A copy of the application and accompanying plans are available by request by contacting the Arlington Conservation at 781-316-3012 or [mmuszynski@town.arlington.ma.us](mailto:mmuszynski@town.arlington.ma.us). For more information call the applicant at 978-852-0672 or the Arlington Conservation Commission at 781-316-3229, or the DEP Northeast Regional Office at 978-694-3200.

NOTE: Notice of the Public Hearing will be published at least five (5) business days in advance in The Arlington Advocate and will also be posted at least 48 hours in advance in the Arlington Town Hall.

\*\*\*\*\*

The meeting information for your hearing is:

Date: 3/21/24

Time: 7:00

**CERTIFIED ABUTTERS LIST**

Date: January 19, 2023

Subject Property Address: 36 PEABODY RD Arlington, MA

Subject Property ID: 121-2-10

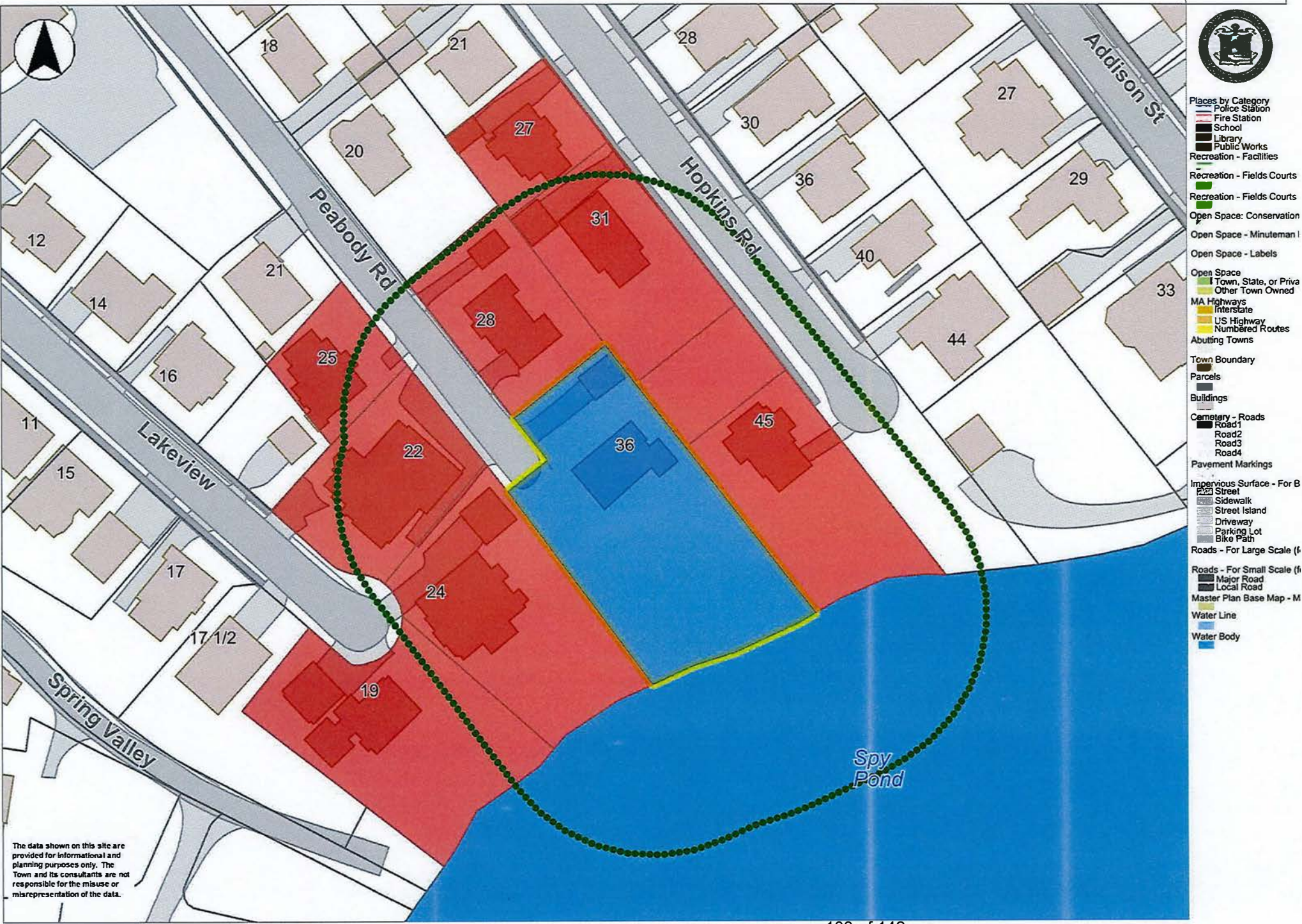
Search Distance: 100 Feet - Conservation

Parcel ID:	Property Location	Owner 1	Owner 2	MAILING ADDRESS			
				Mailing Address 1	Town	State	Zip
121-1-6	25 PEABODY RD	WADSWORTH MARY DEIRDRE		25 PEABODY RD	ARLINGTON	MA	02476
121-1-7	22 LAKEVIEW	22 LAKEVIEW LLC		31 PHILEMON STREET	ARLINGTON	MA	02474
121-1-8	26 LAKEVIEW	BOWES ROBERT E & ELAINE M/ TRS	ROBERT E BOWES TRUST	26 LAKEVIEW	ARLINGTON	MA	02476
121-2-5	27 HOPKINS RD	CONN KATHARINE	MANQUIN BRENDAN	27 HOPKINS RD	ARLINGTON	MA	02476
121-2-7	31 HOPKINS RD	AUMULLER CHRISTIAN		PO BOX 292	ARLINGTON	MA	02476
121-2-8	0-LOT HOPKINS RD	CAP GMBH		PO BOX 292	ARLINGTON	MA	02476
121-2-9	45 HOPKINS RD	CAP GMBH		PO BOX 292	ARLINGTON	MA	02476
<b>121-2-10</b>	<b>36 PEABODY RD</b>	<b>JESSEN IAN</b>	<b>HATCH ELIZA</b>	<b>36 PEABODY RD</b>	<b>ARLINGTON</b>	<b>MA</b>	<b>02476</b>
121-2-11	28 PEABODY RD	BLAIR COLIN C & SUSANNE S /TRS	COLIN & SUSANNE BLAIR TRUST	28 PEABODY RD	ARLINGTON	MA	02476
122-5-16.B	19 LAKEVIEW	BARBERA MARIANNE		19 LAKEVIEW	ARLINGTON	MA	02476

The Board of Assessors certifies the names and addresses of requested parties in interest, all abutters to a single parcel within 100 feet.

Town of Arlington  
Office of the Board of Assessors  
730 Massachusetts Ave  
Arlington, MA 02476  
P: 781.316.3050  
E: assessors@town.arlington.ma.us





The data shown on this site are provided for informational and planning purposes only. The Town and its consultants are not responsible for the misuse or misrepresentation of the data.



- Places by Category**
- Police Station
  - Fire Station
  - School
  - Library
  - Public Works
  - Recreation - Facilities
- Recreation - Fields Courts**
- Recreation - Fields Courts
- Open Space: Conservation**
- Open Space - Minuteman I
  - Open Space - Labels
- Open Space**
- Town, State, or Private
  - Other Town Owned
- MA Highways**
- Interstate
  - US Highway
  - Numbered Routes
  - Abutting Towns
- Town Boundary**
- Parcels
  - Buildings
- Cemetery - Roads**
- Road1
  - Road2
  - Road3
  - Road4
- Pavement Markings**
- Impervious Surface - For B
  - Street
  - Sidewalk
  - Street Island
  - Driveway
  - Parking Lot
  - Bike Path
- Roads - For Large Scale (ft)**
- Roads - For Small Scale (ft)
  - Major Road
  - Local Road
- Master Plan Base Map - M**
- Water Line
  - Water Body



### Affidavit of Service


(Please return to Conservation Commission)

I, Eliza Hatch , being duly sworn, do hereby state as follows: on March 5, 2024, I mailed a "Notification to Abutters" in compliance with the second paragraph of Massachusetts General Laws, Chapter 131, s.40, the DEP Guide to Abutter Notification dated April 8, 1994, and the Arlington Wetlands Protection Bylaw, Title V, Article 8 of the Town of Arlington Bylaws in connection with the following matter:

Repairing walls, adjusting placement of staircase, moving/replacing trees at 36 Peabody Road, Arlington, MA 02476.

The form of the notification, and a list of the abutters to whom it was provided and their addresses, are attached to this Affidavit of Service.

Signed under the pains and penalties of perjury, this 5<sup>th</sup> day of March.

  
\_\_\_\_\_  
Name

### Bylaw Filing Fees and Transmittal Form

**Rules:**

1. Fees are payable at the time of filing the application and are non-refundable.
2. Fees shall be calculated per schedule below.
3. Town, County, State, and Federal Projects are exempt from fees.
4. These fees are in addition to the fees paid under M.G.L. Ch. 131, s.40 (ACT).

**Fee Schedule (ACC approved 1/8/15):**

\$	No./Area	Category
\$150		(R1) RDA- \$150 local fee, no state fee
		(N1) Minor Project - \$200 (house addition, tennis court, swimming pool, utility work, work in/on/or affecting any body of water, wetland or floodplain).
		(N2) Single Family Dwelling - \$600
		(N3) Multiple Dwelling Structures - \$600 + \$100 per unit all or part of which lies within 100 feet of wetlands or within land subject to flooding.
		(N4) Commercial, Industrial, and Institutional Projects - \$800 + 50¢/s.f. wetland disturbed; 2¢/s.f. land subject to flooding or buffer zone disturbed.
		(N5) Subdivisions - \$600 + \$4/l.f. feet of roadway sideline within 100 ft. of wetlands or within land subject to flooding.
		(N6) Other Fees - copies, printouts; per public records law
		(N7) Minor Project Change - \$50
		(N8) Work on Docks, Piers, Revetments, Dikes, etc - \$4 per linear foot
		(N9) Resource Boundary Delineation (ANRAD) - \$1 per linear foot
		(N10) Certificate of Compliance (COC or PCOC) - No charge if before expiration of Order, \$200 if after that date.
		(N11) Amendments - \$300 or 50% of original local filing fee, whichever is less.
		(N12) Extensions -
		a. Single family dwelling or minor project - \$100.
		b. Other - \$150.
		(N13) Consultant Fee -per estimate from consultant
\$150	TOTAL	

**Note:** Submit this form along with the forms submitted for the ACT - the "Wetlands Filing Fee Calculations Worksheet," and the "Notice of Intent Fee Transmittal Form."

Legal Notice Charge Authorization

DATE: March 5, 2024

TO: legals@wickedlocal.com

I hereby authorize Community Newspapers to bill me directly for the legal notice to be published in the Arlington Advocate newspaper on \_\_\_\_\_ for a public hearing with the Arlington Conservation Commission to review a project at the following location:

36 Peabody Road, Arlington

Thank you.

Signed: 

Send bill to:

ELIZA WATZ (Address)

36 PEABODY RD

ARLINGTON MA 02476

978-852-0672 (Phone)





## Town of Arlington, Massachusetts

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**DEP #091-0278: Amendment to Order of Conditions: 88 Coolidge Road (Continued from 3/21/2024).**

**Summary:**

This public hearing will consider the peer review report for an amendment to an Order of Conditions for construction of a new house at 88 Coolidge Road in the Buffer Zone to a Bordering Vegetated Wetland. The Commission will vote to continue this hearing to the meeting of April 4, 2024.

**ATTACHMENTS:**

	Type	File Name	Description
▢	Reference Material	88_Coolidge_Road_-_Technical_Memo.pdf	88 Coolidge Road - Technical Memo

March 15, 2024

**TECHNICAL MEMORANDUM**

To:	Jonathan Nyberg, Old New England Properties, Inc.	Pages: 7
CC:	Al Gala, PE, Gala Simon Associates, Inc.	
Subject:	Mounding Analysis for Subsurface Infiltration at 88 Coolidge Road	
From:	Matt Hodge PE, Hodge.WaterResources, LLC	

Old New England Properties, Inc. asked Hodge.WaterResources, LLC (HWR) to conduct a mounding analysis for two exfiltration systems that are part of the proposed development of the property located at 88 Coolidge Road in Arlington, Massachusetts. HWR understands that the need for a mounding analysis is in response to comments from Nobis Engineering, Inc. (Nobis) on behalf of the Conservation Commission of the town of Arlington. HWR understands that Nobis suggested that a mounding analysis was necessary because the distance from the bottom of the exfiltration systems to the underlying ledge/bedrock is less than four feet. HWR infers from Nobis's request that Nobis is applying the Massachusetts Stormwater Handbook (Handbook) to the site. According to the site design engineer, Al Gala, P.E., the proposed development at the property is exempt from the requirements of the Handbook because of the size of the property. HWR has no opinion on the applicability of the Handbook to the site.

HWR does hold the opinion that a mounding analysis as described in the Handbook (i.e., the Hantush method) is not readily applied to exfiltration systems at the site for the following reasons.

- There is a thin overburden on the site that overlays ledge/bedrock. All information that HWR has reviewed with respect to the overburden indicates that the overburden drains wells, and any intermittent water level above the bedrock is only a few inches thick.
- There is no underlying aquifer for infiltrated stormwater to "mound" above. There is no seasonal high groundwater.
- The slope of the underlying ledge/bedrock increases the rate of groundwater flow over the bedrock, and through the overburden. Mounding analyses based on the Hantush method likely overestimates the height and duration of mounding underneath the exfiltration systems at the property.
- A Hantush method-based mounding analysis is conservative.

Notwithstanding these concerns, HWR has completed a mounding analysis for each exfiltration system. In each case, HWR used the software: HANTUSH Time and Distance Mounding Analysis developed by GeoHydroCycle, Inc.

**The results of the analysis indicate that the maximum mounding height underneath Exfiltration System 1 will be 3.0 feet (ft) and underneath Exfiltration System 2 will be 4.7 ft. Neither mound reaches the bottom of the system and both systems drain sufficiently so that they are completely drained within 72 hours after the end of a precipitation event.**

The remainder of this memorandum provides a description of the mounding analysis completed for each system.

March 15, 2024

## Mounding Analysis Set Up

A mounding analysis using the Hantush method requires a series of inputs about the exfiltration system and the underlying aquifer. Table 1 provides a summary of the inputs used by HWR in the mounding analysis. Table 1 also provides the reference for the selected value.

**Table 1: Hantush Analysis Inputs Summary**

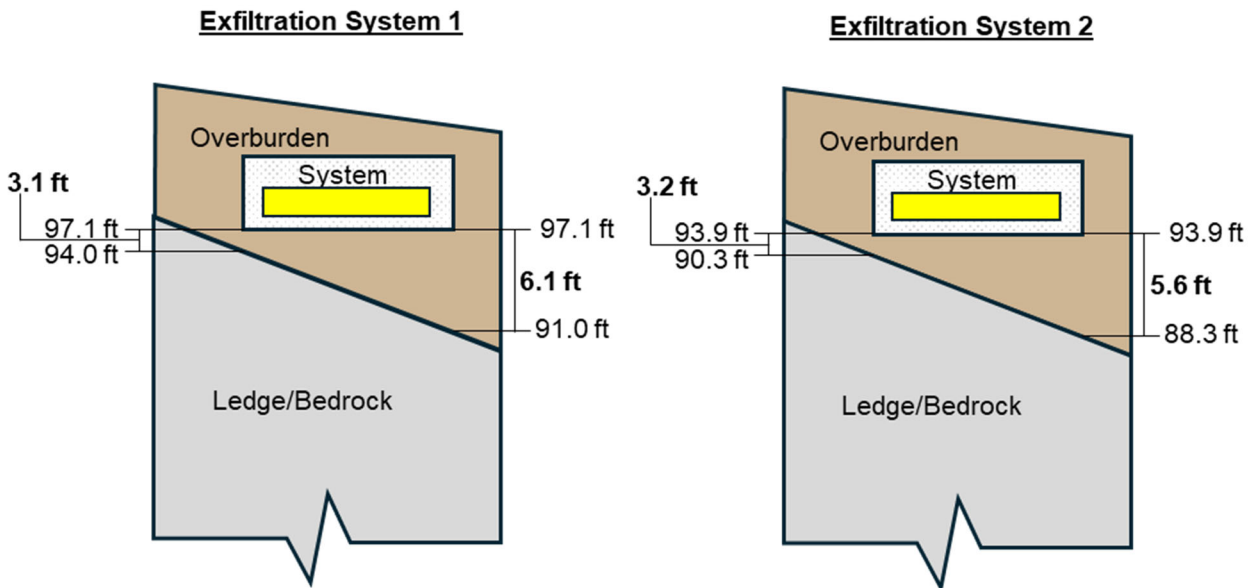
Analysis Input	System 1	System 2	Source
<b>Exfiltration System</b>			
Length (ft)	25.0	26.5	Site plans see Attachment A
Width (ft)	11.7	8.3	Site plans see Attachment A
Volume* (ft <sup>3</sup> )	279	495	Correspondence with design engineer Al Gala, PE
Duration (days)	1	1	By convention (Koenigsberg, 2023)
Exfiltration Rate (ft/d)	0.95	2.25	By convention (Koenigsberg, 2023)
Distance from System to Water (ft)	3.1	3.2	Per site plans, minimum distance between system and sloped ledge, see Attachment A
<b>Hydrogeologic Characteristics</b>			
Horizontal Hydraulic Conductivity (ft/d)	2.8	2.8	Representative conductivity for silty sand (i.e., 10 <sup>-3</sup> cm/s) (Freeze & Cherry, 1979)
Drainage Porosity (Specific Yield) --	0.2	0.2	Representative for Sandy Loam (Johnson, 1967)
Saturated Thickness (ft)	3.0	4.7	See subsequent discussion

\* The required recharge volume for the entire site, per the Handbook, is 58 cubic feet (ft<sup>3</sup>). The exfiltration systems are larger than would be required by the Handbook. HWR used the total storage volume in order to conservatively evaluate mounding.

## Exfiltration System Discussion

The exfiltration system dimensions and exfiltration rate are derived from site plans and by convention. The distance from the bottom of each exfiltration system to water requires professional judgment. The underlying ledge/bedrock is steeply sloped. The upgradient end of the systems are closer to the ledge/bedrock than the downgradient end of the systems. Figure 1 shows a conceptual cross section of the systems' elevations and distances based on the Site Plans that are included as Attachment A to this memorandum.

For the purposes of the mounding analysis, HWR used the minimum distance (i.e., the upgradient end) for both exfiltration systems in the mounding analysis.



**Figure 1. Cross Section Elevations Exfiltration Systems (Not To Scale)**

### **Hydrogeologic Characteristics**

The hydrogeologic characteristics of the overburden at the property have not been directly measured. The site design engineer described the overburden as sandy loam. Recorded observations for test pits on site identify the overburden as fine sandy loam, silty loam, and loamy sand. HWR used these descriptions of the overburden to establish the horizontal hydraulic conductivity and drainage porosity consistent with the references identified in Table 1.

Determination of the saturated thickness is the analysis input that most highlights the limitations of the Hantush method when applied to the systems at this property. There is no underlying aquifer. With no underlying aquifer, the saturated thickness could be determined to be 0 ft. The Hantush method cannot calculate a mounding height with a saturated thickness of 0 ft. In order to apply the Hantush method, HWR used the following rationale to establish the saturated thickness.

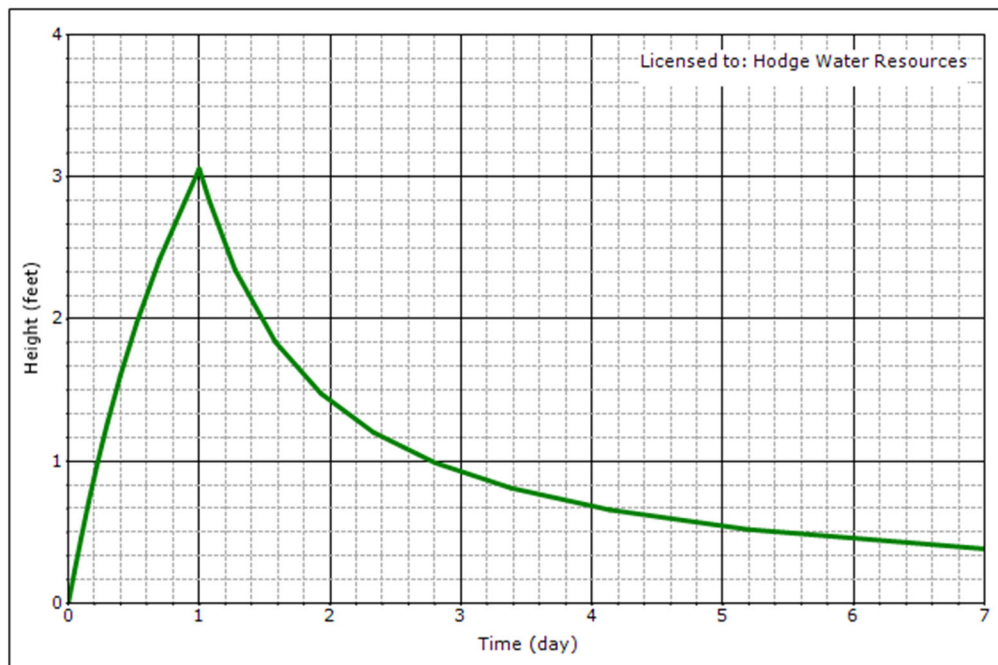
The saturated thickness is intended to represent the depth of water available for the movement of groundwater. In this case, that depth is the height of the mound itself as long as there is no barrier preventing the horizontal flow of water (e.g., the sidewall of a storage chamber). HWR elected to iteratively run the analysis for each system by adjusting the saturated thickness until the maximum mounding height was approximately equal to the saturated thickness. HWR believes that this is the most reasonable application of the Hantush method to the exfiltration systems at the property.

### **Mounding Analysis Results**

Figure 2 shows the results of the mounding analysis of Exfiltration System 1 and Figure 3 shows the results of the mounding analysis for Exfiltration System 2.

March 15, 2024

## Mound Height versus Time



## Mound Height versus Distance

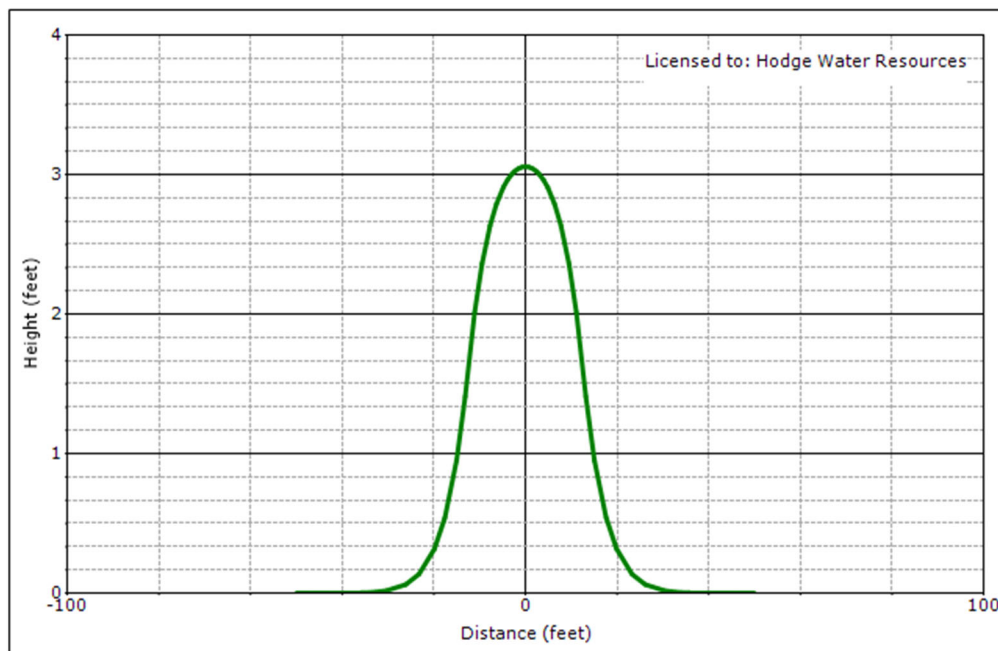
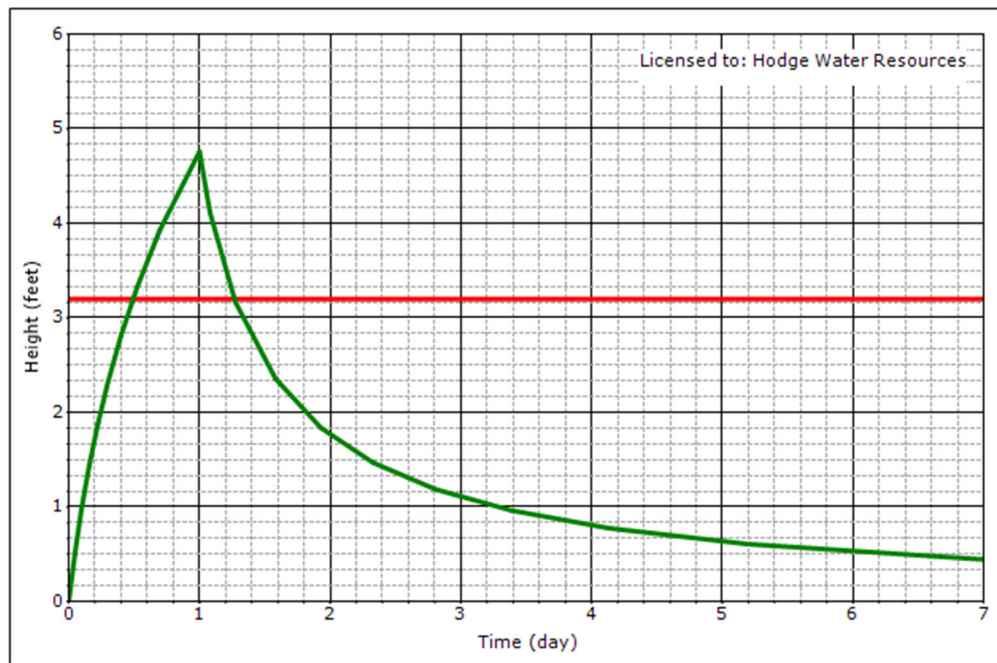


Figure 2. Mounding Analysis Results (Exfiltration System 1)

March 15, 2024

### Mound Height versus Time



### Mound Height versus Distance

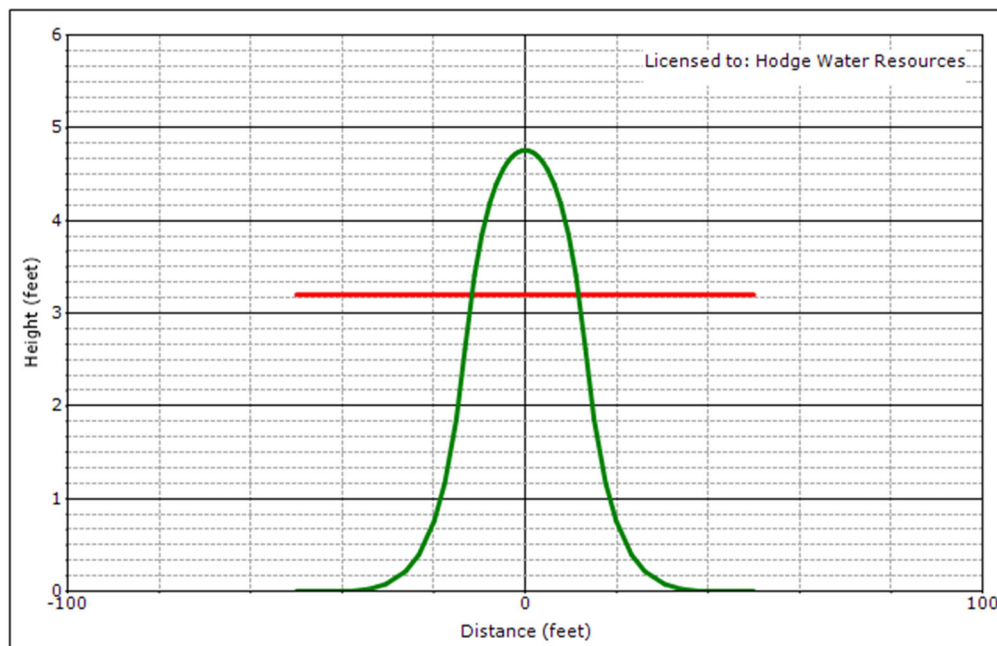


Figure 3. Mounding Analysis Results (Exfiltration System 2)



March 15, 2024

The Handbook requires that a mounding analysis demonstrate that exfiltration systems meet the following requirements.

1. The required recharge volume is fully dewatered within 72 hours after the end of the precipitation event.
2. The groundwater mound will not break out above the land surface.

The mound from Exfiltration System 1 stays below the bottom of the exfiltration system. The mound for Exfiltration System 2 rises above the bottom of the exfiltration system but does not rise above the ground surface (estimated as 99.0 ft or 8.3 ft above the ledge on the upgradient side). Both systems drain within 72 hours, and both systems meet the requirements of the Handbook.

### Sensitivity

HWR recognizes that results shown in Figure 2 and Figure 3 are sensitive to the assumed horizontal hydraulic conductivity (K). HWR conducted limited sensitivity testing of the analysis results by re-running the analysis assuming a horizontal hydraulic conductivity of 1.4 ft/d and 5.6 ft/d (i.e., halved and doubled). These analysis results are summarized in Table 2 and shown in Attachment B.

**Table 2: Sensitivity Results**

Scenario	Exfiltration System 1		Exfiltration System 2	
	Mounding Height (ft)	System Drains in less than 72 hours	Mounding Height (ft)	System Drains in less than 72 hours
<b>K = 2.8 ft/d</b>	<b>3.0</b>	<b>Yes</b>	<b>4.7</b>	<b>Yes</b>
K = 1.4 ft/d	3.6	Yes	5.9	Yes
K = 5.6 ft/d	2.5	Yes	3.7	Yes

The results of the sensitivity analysis demonstrate that a horizontal hydraulic conductivity that is 50% smaller than the assumed value still provides mounding analysis results that meet the requirements of the Handbook. The resulting mounding height for Exfiltration System 1 is 3.6 ft. The mound enters the storage chamber but does not break out above the land surface. HWR draws this conclusion because the top of stone for Exfiltration System 1 is at an elevation of 99.1 ft or 5.1 ft above ledge on the upgradient end of the system. HWR applies a similar thinking to Exfiltration System 2 where the mound height is 5.9 ft, but the top of stone in the system is 99.0 ft or 8.3 ft above the ledge on the upgradient side. Both systems drain in less than 72 hours. The mounding height is very sensitive to assumed hydraulic conductivity. All information reviewed by HWR point a well-draining overburden. HWR believes the assumed values for Hantush analysis are reasonable.

### Summary

HWR conducted a mounding analysis of the exfiltration systems that are proposed at 88 Coolidge Road in Arlington, Massachusetts. The mounding analysis indicates that if the Massachusetts Stormwater Handbook were applicable to the site, the exfiltration systems would meet the requirements for groundwater mounding. HWR recognizes that there is a degree of uncertainty associated with the results of the mounding analysis, but HWR used a number of conservative assumptions including: assumed recharge volume is much larger than the required recharge volume per the Handbook and assumed minimum distance from bottom of systems to ledge/bedrock. Given these conservative assumptions, HWR concludes that groundwater mounding at the property will meet the requirement of the Massachusetts Stormwater Handbook.

## **References**

Freeze, R.A. and Cherry, J.A., 1979. Groundwater. Prentice Hall, Inc. Upper Saddle River, New Jersey.

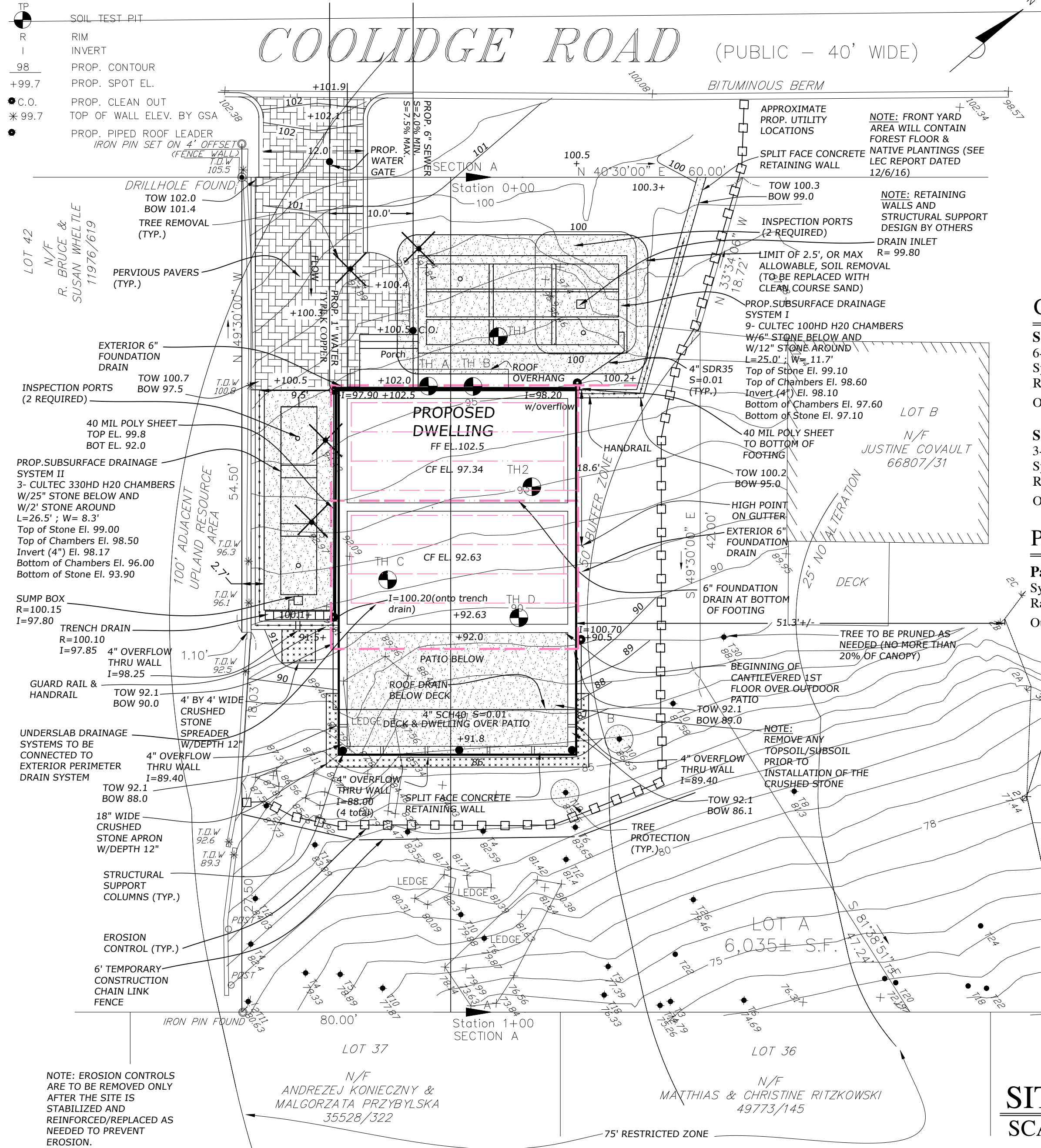
Johnson, A.I., 1967. Specific Yield—Compilation of Specific Yields for Various Materials. Water Supply Paper 1662-D. United States Geological Survey. Available from: <https://pubs.usgs.gov/wsp/1662d/report.pdf>.

Koenigsberg A., 2023. Evaluation of Stormwater Management System Mounding Analysis. Town of Westborough Massachusetts Conservation Department. Accessed March 7, 2024. Available from: <https://www.westboroughma.gov/1174/Mounding-Analysis-Evaluation-Standards>.

**Attachment A: Site Plan**



LEGEND



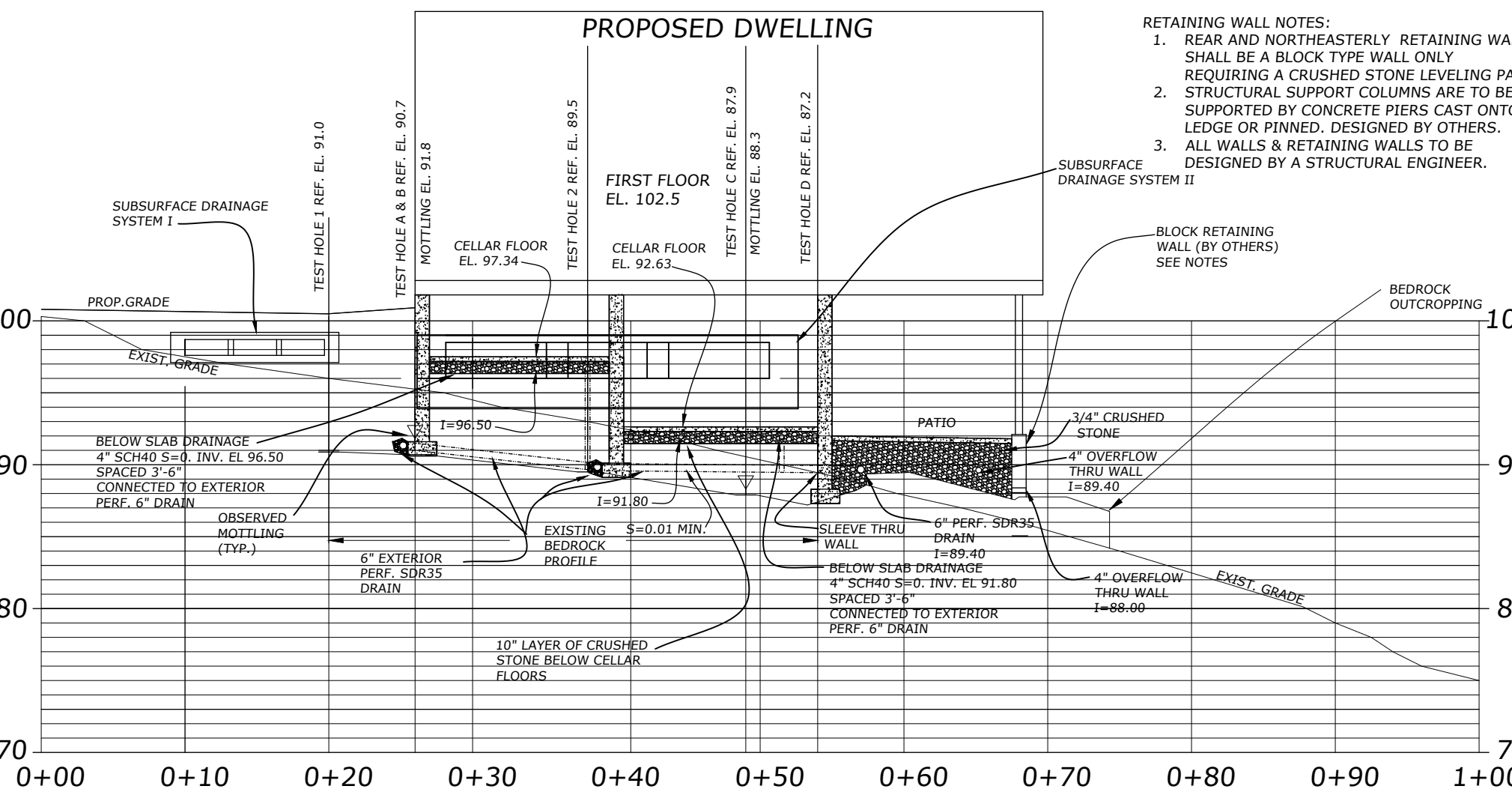
STORM EVENT	EXISTING CONDITIONS PEAK RUNOFF (cfs)	EXISTING CONDITIONS VOLUME (af)	PROPOSED CONDITIONS PEAK RUNOFF (cfs)	PROPOSED CONDITIONS VOLUME (af)
2-YEAR (3.22")	0.04	0.005	0.02	0.003
10-YEAR (4.88")	0.18	0.014	0.09	0.008
25-YEAR (6.18")	0.31	0.024	0.17	0.013
100-YEAR (8.87")	0.63	0.046	0.34	0.031

PRE VS. POST IMPERVIOUS AREAS			
RUNOFF SURFACE	EXISTING (SF)	PROPOSED (SF)	
ROOF	0	1,240	
DRIVEWAY	0	623	
FRONT OVERHANG & PORCH	0	76	
RETAINING WALL	0	59	
TOTAL	0	1,998	

NOTES: 1. ALL IMPERVIOUS SURFACES ARE ROUTED INTO SUBSURFACE SYSTEMS.

AS BUILT NOTE:

CONTRACTOR IS TO CONTACT ENGINEER FOR AS-BUILT MEASUREMENTS PRIOR TO BACK FILLING DRAINAGE SYSTEMS.



SECTION A-A

SCALE: 1" = 10' H & V

SAFETY NOTE:

CONTRACTOR IS TO IMPLEMENT ALL NECESSARY SAFETY AND CONSTRUCTION MEASURES AND PROCEDURES FOR THE CONSTRUCTION OF THE PROJECT. STRICT COMPLIANCE WITH FEDERAL, STATE AND LOCAL SAFETY AND CONSTRUCTION REQUIREMENTS IS MANDATORY.

TOWN OF ARLINGTON

ENGINEERING DIVISION

INSPECTION SIGN OFF:

CHAMBER OUTFLOW RATE

Subsurface Drainage System I

6-Cultec 100HD H20 Chambers

System Base Area = 204 sf

Rawl's Rate (Sandy Loam) = 1.02 in/hr

Outflow rate =  $\left( \frac{(1.02 \text{ in/hr})}{(3600 \text{ sec})} \right) * 204 \text{ sf} = 0.005 \text{ cfs}$

Subsurface Drainage System II

3-Cultec 330HD H20 Chambers

System Base Area = 221 sf

Rawl's Rate (Sandy Loam) = 1.02 in/hr

Outflow rate =  $\left( \frac{(1.02 \text{ in/hr})}{(3600 \text{ sec})} \right) * 221 \text{ sf} = 0.005 \text{ cfs}$

PAVERS OUTFLOW RATE

Paver System

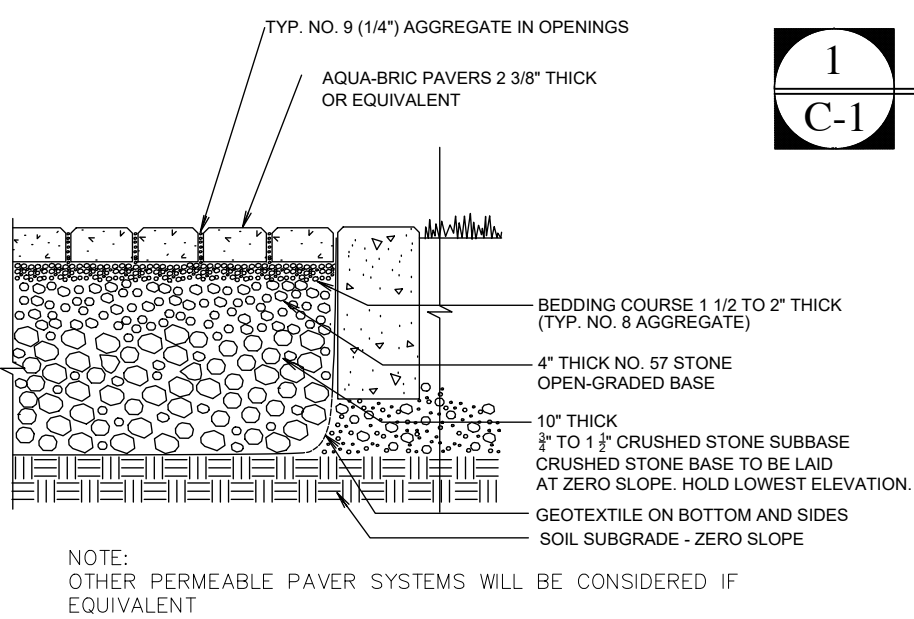
System Base Area = 362 sf

Rawl's Rate (Sandy Loam) = 1.02 in/hr

Outflow rate =  $\left( \frac{(1.02 \text{ in/hr})}{(3600 \text{ sec})} \right) * 362 \text{ sf} = 0.008 \text{ cfs}$

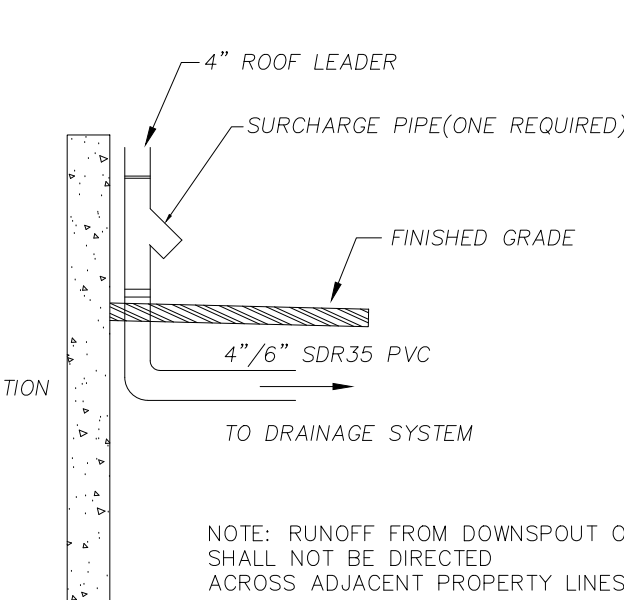
SITE PLAN

SCALE: 1" = 10'



2 PERMEABLE PAVING SECTION

SCALE: NTS

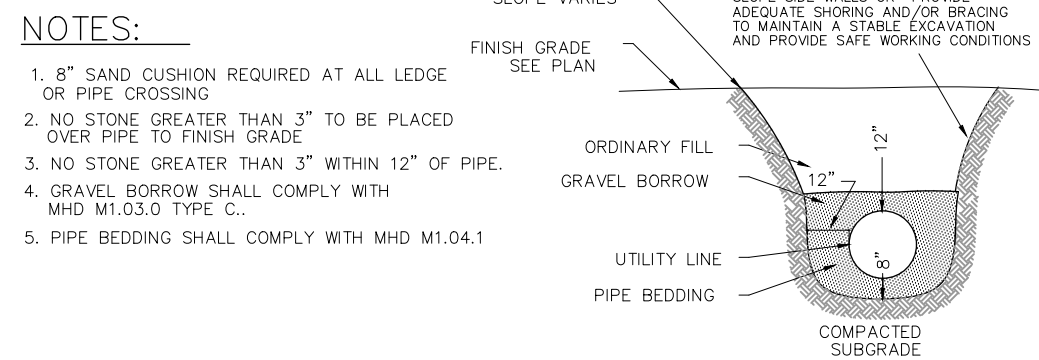


4 ROOF LEADER W/DOWN SPOUT

SCALE: NTS

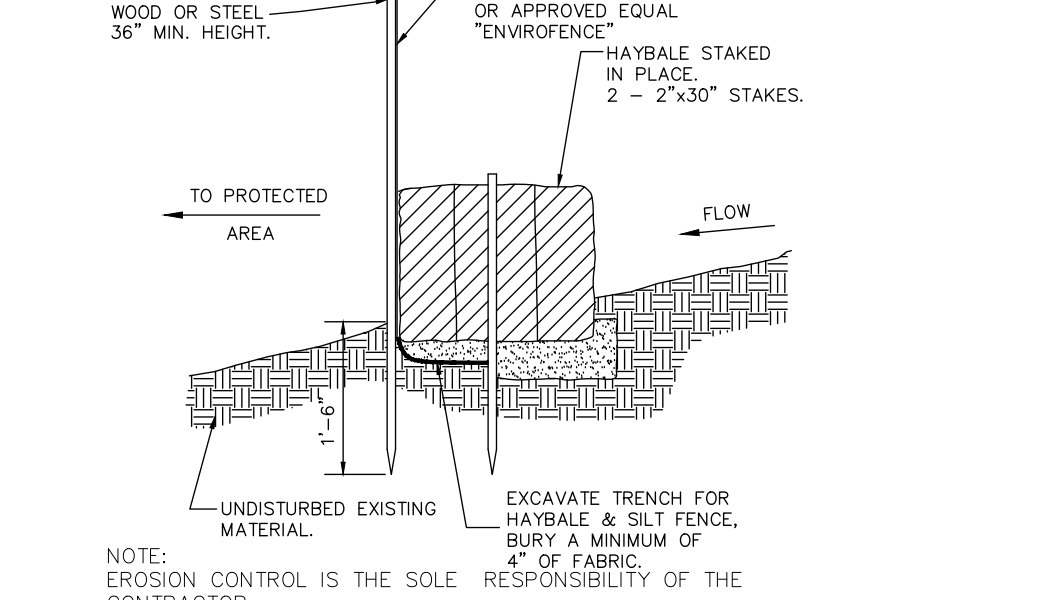
1 TRENCH DRAIN

SCALE: NTS



3 TYP. UTILITY TRENCH

SCALE: NTS



5 HAYBALE/SILT FENCE BARRIER

SCALE: NTS

GENERAL NOTES

- EXISTING CONDITIONS SURVEY INFORMATION OBTAINED FROM ROBER SURVEY, ARLINGTON, MA. OWNER/CLIENT ASSUMES ALL RESPONSIBILITY FOR SOURCES AND AUTHORIZATION TO USE ELECTRONIC AND RECORD FILES.
- THE CONTRACTOR SHALL VERIFY ALL EXISTING INFORMATION ON THE GROUND AND SHALL REPORT ALL DISCREPANCIES TO THE ENGINEER IMMEDIATELY FOR A DECISION PRIOR TO CONSTRUCTION.
- ALL AREAS OUTSIDE OF THE LIMIT OF WORK LINES SHALL NOT BE DISTURBED IN ANY MANNER BY THE CONTRACTOR OPERATIONS. THE CONTRACTOR SHALL KEEP OUT OF THESE AREAS AND PRESERVE THEIR EXISTING CHARACTER.
- INSTALL TEMPORARY EROSION CONTROL MEASURES PRIOR TO CONSTRUCTION FOR APPROVAL BY THE DESIGN ENGINEER.
- PROVIDE SMOOTH TRANSITION AT CHANGES IN GRADE EXCEPT AS INDICATED ON THE DRAWINGS AND AS DIRECTED BY THE ENGINEER.
- THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL UNDERGROUND UTILITIES PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL UNDERGROUND UTILITY LINES: ACTIVE OR NOT, AND SHALL MAINTAIN A CLOSE AND CONSTANT CONTACT WITH ALL UTILITY COMPANIES INVOLVED. CALL DIG-SAFE 888-344-7233
- ALL ELEVATIONS ARE REFERENCED TO AN ASSUMED DATUM.
- CONTRACTOR SHALL COMPLY WITH ALL REQUIREMENTS, PERMITTING, AND LICENSES ISSUED AT THE FEDERAL, STATE AND LOCAL AGENCIES.
- CONTRACTOR SHALL COORDINATE ALL SITE UTILITY IMPROVEMENTS WITH THE TOWN OF ARLINGTON AND MWRA OFFICIALS.
- ENGINEER IS TO BE CONTACTED BY CONTRACTOR TO PERFORM AS BUILT MEASUREMENTS.
- OWNER/DEVELOPER IS TO COMPLY WITH ALL OF MASSACHUSETTS DEP SITE DEVELOPMENT REGULATIONS.
- ROADWAY IS TO BE SWEEP, OR OTHERWISE CLEANED OF DEBRIS AND SEDIMENT, AT THE END OF EACH WORKDAY.
- CONTRACTOR IS TO COORDINATE INSPECTIONS OF THE SUBSURFACE DRAINAGE SYSTEM WITH THE TOWN OF ARLINGTON ENGINEERING DIVISION. ONE INSPECTION WILL BE REQUIRED FOR THE BOTTOM OF THE BED AND ANOTHER AFTER INSTALLATION AND PRIOR TO BACKFILLING. ENGINEERING DIVISION REQUIRES 24 HOURS ADVANCE NOTICE.
- SITE GRADING AND DOWNSPOUT OVERFLOWS SHALL NOT DIRECT CONCENTRATED STORMWATER RUNOFF ONTO ADJUTING PROPERTIES.
- ANY PROPOSED AND/OR FUTURE SUMP PUMP INSTALLATION SHOULD NOT BE DISCHARGED TOWARDS THE PUBLIC WAY.
- THE TOWN OF ARLINGTON IS NOT A MEMBER OF DIGSAFE. THE CONTRACTOR, IN ADDITION TO CALLING DIGSAFE, MUST ALSO CONTACT THE TOWN OF ARLINGTON WATER AND SEWER DIVISION (781-316-3310) AT LEAST 72 HOURS PRIOR TO ANY EXCAVATIONS.
- A CERTIFIED ARBORIST WILL BE PRESENT DURING WALL CONSTRUCTION TO INSURE ANY TREE ROOTS ARE CLEANLY CUT AND THAT TREES ARE ADEQUATELY PROTECTED DURING WALL CONSTRUCTION.
- CONNECTION OF SUMP PUMP SYSTEMS TO THE PROPOSED STORMWATER MANAGEMENT SYSTEM IS PROHIBITED FOR CURRENT AND FUTURE OWNERS.
- IF SOIL CONDITIONS DO NOT MATCH THE TEST PIT INFORMATION, THE CONTRACTOR SHALL CONTACT THE DESIGN ENGINEER AND ARLINGTON ENGINEERING DIVISION FOR REVIEW.
- CERTIFIED AS-BUILT PLANS OF THE DRAINAGE SYSTEM, INCLUDING ELEVATIONS, DIMENSIONS AND SWING TIES, AND IMPERVIOUS SURFACE AREA, SHALL BE PROVIDED TO THE ARLINGTON ENGINEERING DIVISION FOLLOWING INSTALLATION.
- ADDITIONAL PERMITTING WILL BE REQUIRED THROUGH THE ARLINGTON ENGINEERING DIVISION FOR THE PROPOSED DRIVEWAY CURB CUTS, SEWER INSTALLATION, WATER INSTALLATION, AND ANY PROPOSED WORK WITHIN THE TOWN OWNED RIGHT OF WAY.

DRAINAGE NOTES:

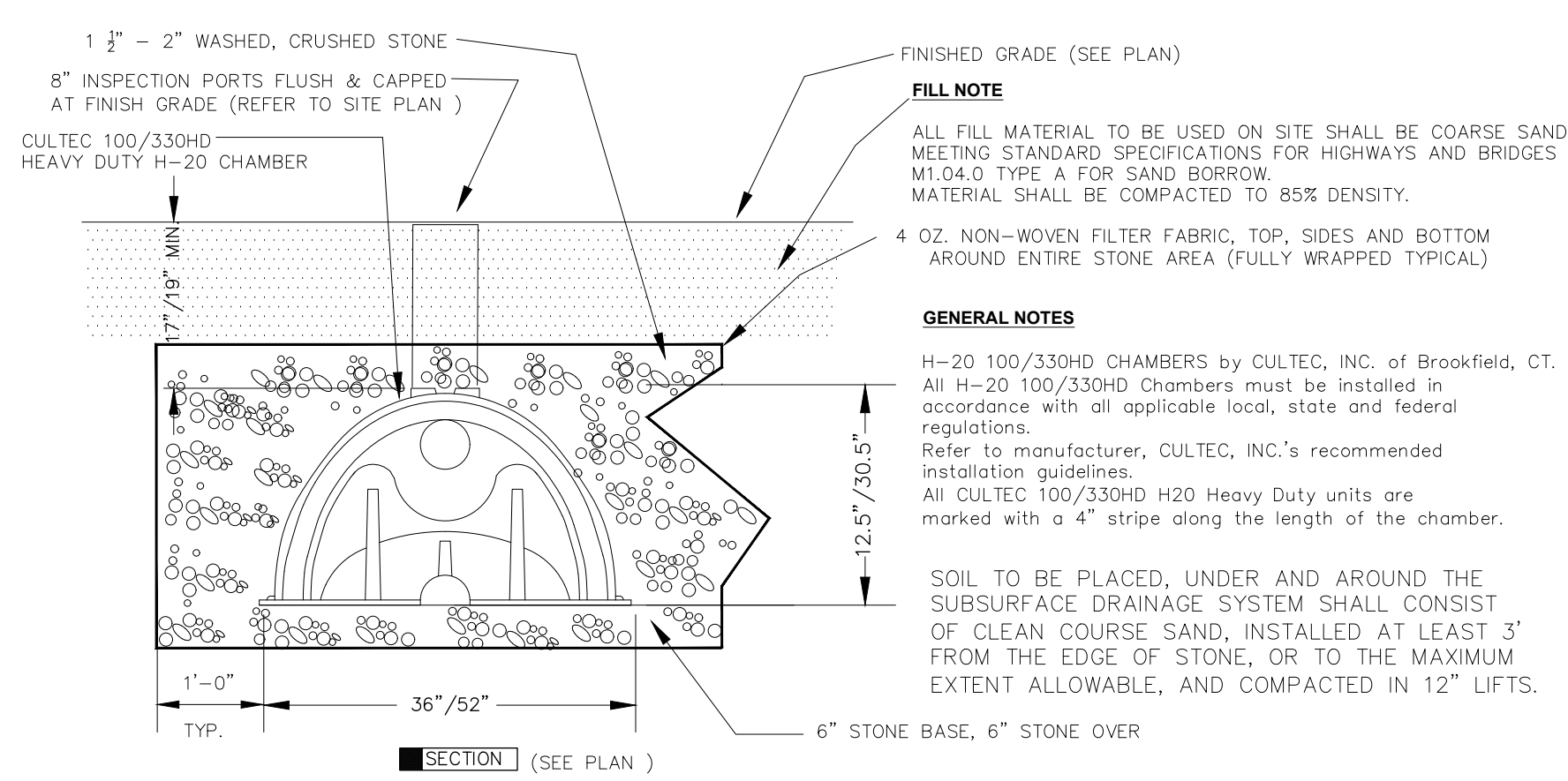
- CONTRACTOR IS RESPONSIBLE FOR THE VERTICAL AND HORIZONTAL CONTROLS OF THE PROJECT.
- INSTALLATION OF THE SUBSURFACE CHAMBERS IS TO BE PERFORMED ACCORDING TO RECOMMENDATIONS FROM THE MANUFACTURER.
- CONTRACTOR IS TO REFER TO ARCHITECTURAL PLANS FOR EXACT LOCATION OF HOUSE DOWNSPOUTS.
- THE MINIMUM CLEARANCE FROM THE BOTTOM OF THE SUBSURFACE DRAINAGE SYSTEM TO REFUSAL OR GROUNDWATER IS 24 INCHES.
- IN THE EVENT THAT THIS CLEARANCE CANNOT BE MAINTAINED, ENGINEER IS TO BE NOTIFIED.
- ALL DRAINAGE PIPING IS SDR35 PVC.
- SYSTEM WILL REQUIRE PERIODIC INSPECTION.
- SOIL TO BE PLACED AROUND AND UNDER ALL THE SUBSURFACE DRAINAGE SYSTEM SHALL CONSIST OF CLEAN COARSE SAND, INSTALLED AT APPROXIMATELY THREE (3) FEET FROM THE EDGE OF STONE AND COMPACTED IN 12 INCH LIFTS.
- SUMP PUMPS ARE PROHIBITED FROM CONNECTING TO THE SUBSURFACE DRAINAGE SYSTEM.

LAYOUT & GRADING NOTES

- CONSULT ALL DRAWINGS AND SPECIFICATIONS FOR COORDINATION REQUIREMENTS BETWEEN ALL TRADES PRIOR TO COMMENCING NEW CONSTRUCTION.
- LOCATION OF EXISTING UTILITIES SHOWN ARE DIAGRAMMATIC ONLY. CONTRACTOR SHALL CONTACT THE PROPER AUTHORITIES IN WRITING TO CONFIRM THE LOCATIONS OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. ANY DAMAGE INCURRED DURING CONSTRUCTION TO ANY UTILITY SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO OWNER.
- CONTRACTOR TO REFER TO A SURVEYOR PLOT PLAN FOR ACCURATE OFFSETS TO PROPERTY LINE.

UTILITY NOTES:

THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING AND DETERMINING THE LOCATION, SIZE AND ELEVATION OF ALL EXISTING UTILITIES, SHOWN OR NOT SHOWN ON THIS PLAN, PRIOR TO ANY CONSTRUCTION. THE ENGINEER SHALL BE NOTIFIED IN WRITING OF ANY UTILITIES FOUND INTERFERING WITH THE PROPOSED CONSTRUCTION AND APPROPRIATE REMEDIAL ACTION BEFORE PROCEEDING WITH THE WORK. THE LOCATION OF ALL UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE AND ARE BASED ON THE FIELD LOCATION OF ALL VISIBLE STRUCTURES SUCH AS CATCH BASINS, MANHOLES, WATERGATES, ETC. AND COMPILED FROM PLANS SUPPLIED BY VARIOUS UTILITY COMPANIES AND GOVERNMENT AGENCIES. ALL CONTRACTORS SHOULD NOTIFY, IN WRITING, ALL UTILITY COMPANIES OR AGENCIES PRIOR TO ANY EXCAVATION WORK. THE TOWN OF ARLINGTON IS NOT A MEMBER OF DIGSAFE. WHERE ACTIVITIES REQUIRE A MARK OUT OF UTILITIES, THE TOWN OF ARLINGTON WATER & SEWER DIVISION SHALL BE CONTACTED AT 781-316-3310 TO REQUEST A MARK OUT AT A MINIMUM OF 72 HOURS PRIOR TO EXCAVATION



6 H-20 CULTEC 100/330HD CHAMBER SYSTEM

SCALE: NTS

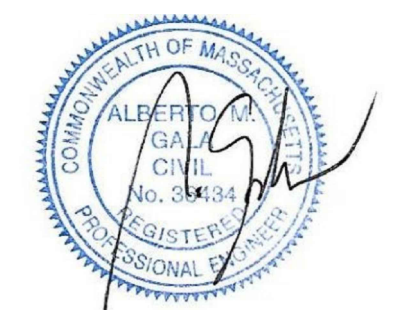
Gala Simon Associates Inc.  
394 LOWELL STREET, SUITE 18  
LEXINGTON, MA 02420  
Tel: (781) 676-2962

GSA  
Civil Engineers

DRAINAGE/GRADING  
PLAN

88 COOLIDGE ROAD  
ARLINGTON  
MASSACHUSETTS

Job No.	1606	Date:	6/3/2016
Drawn By:	AG	Scale:	AS SHOWN
Rev#	Date:	Description:	
1	8.31.16	Section	
2	9.27.16	BBVW, House	
3	10.18.16	Grading	
4	11.17.16	House, drive	
5	12.2.16	House, drive	
6	07.03.17	Soils, elevs.	
7	08.07.17	Section	
8	09.22.20	Section	
9	04.21.22	House	
10	05.16.22	Comments	
11	10.30.23	drains	
12	1.3.24	per comments	
13	3.14.24	System1	



C-1



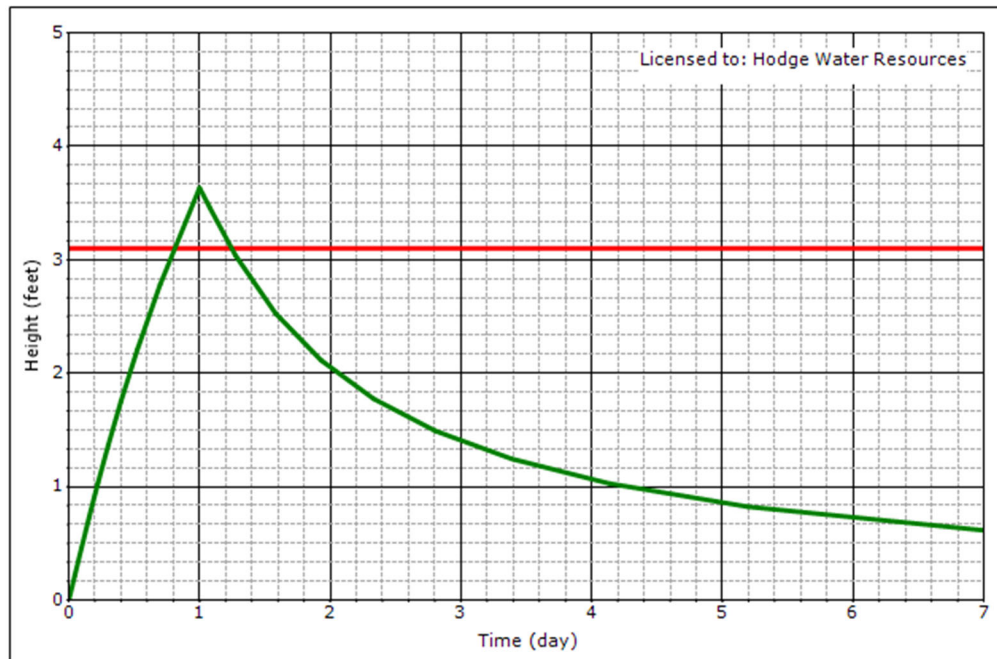
**Attachment B: Sensitivity Results**



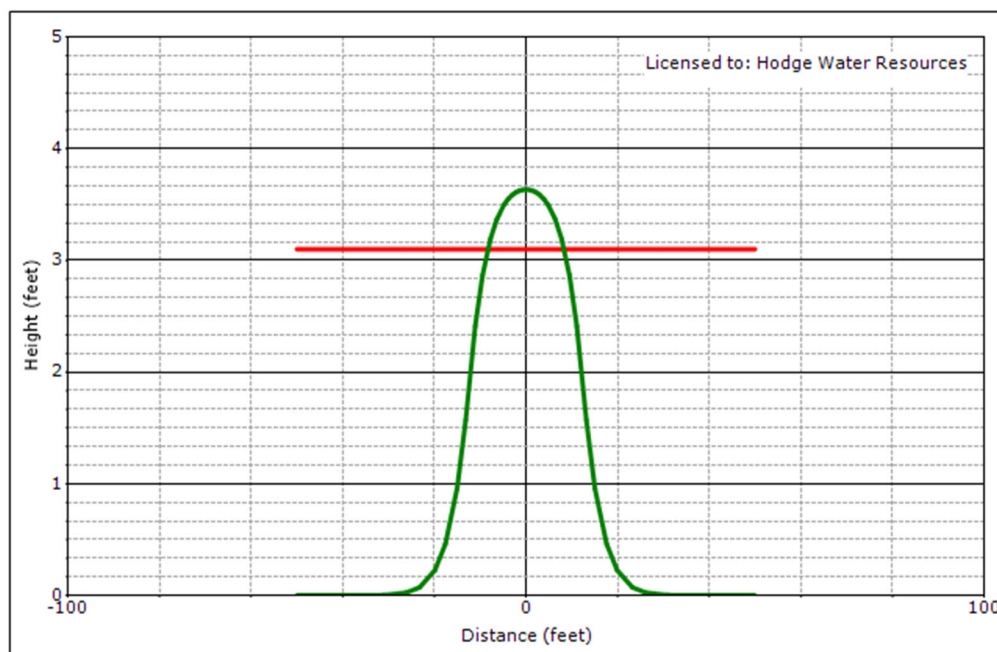
March 15, 2024

Exfiltration System 1,  $K = 1.4 \text{ ft/d}$

Mound Height versus Time



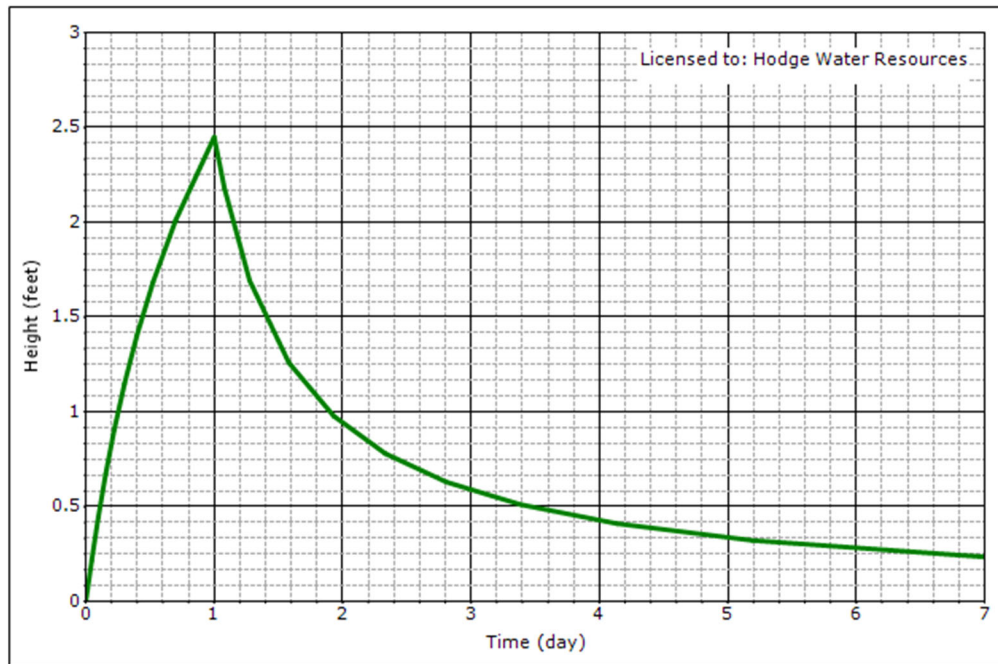
Mound Height versus Distance



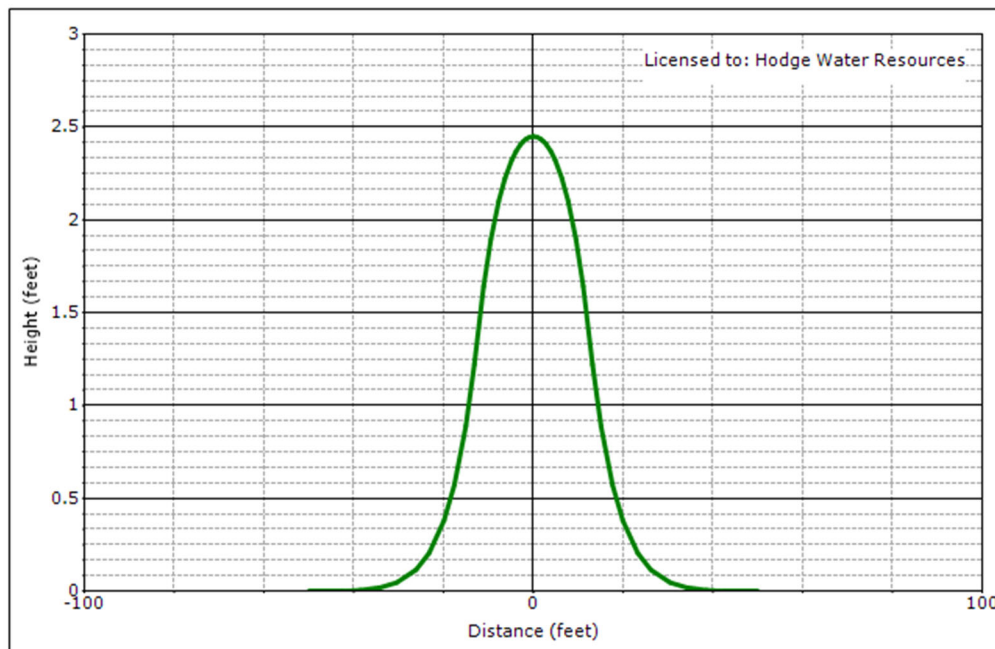
March 15, 2024

Exfiltration System 1,  $K = 5.6 \text{ ft/d}$

Mound Height versus Time



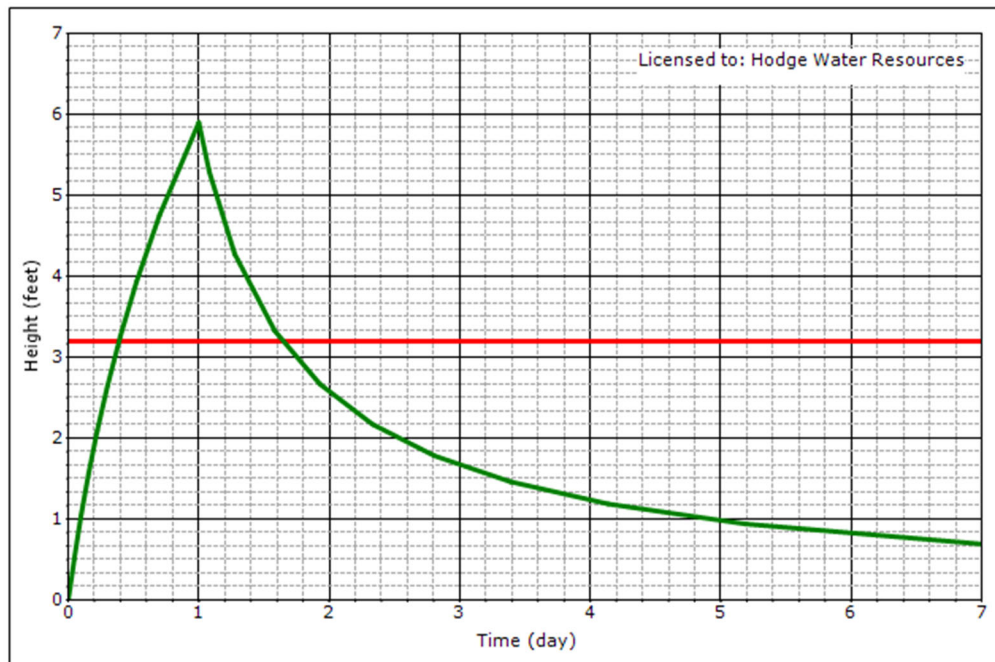
Mound Height versus Distance



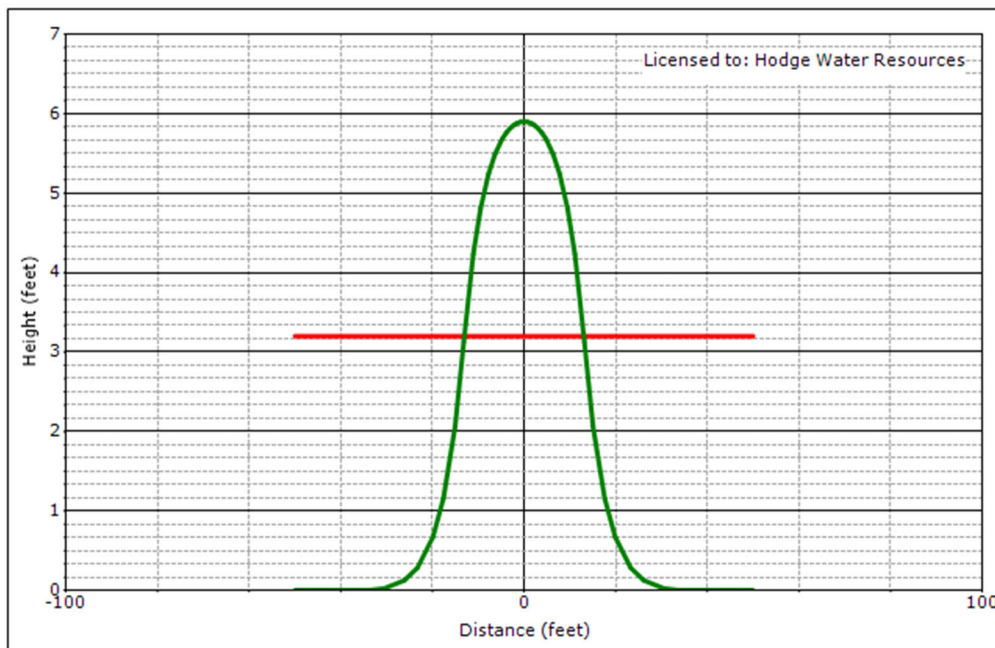
March 15, 2024

Exfiltration System 2,  $K = 1.4 \text{ ft/d}$

Mound Height versus Time



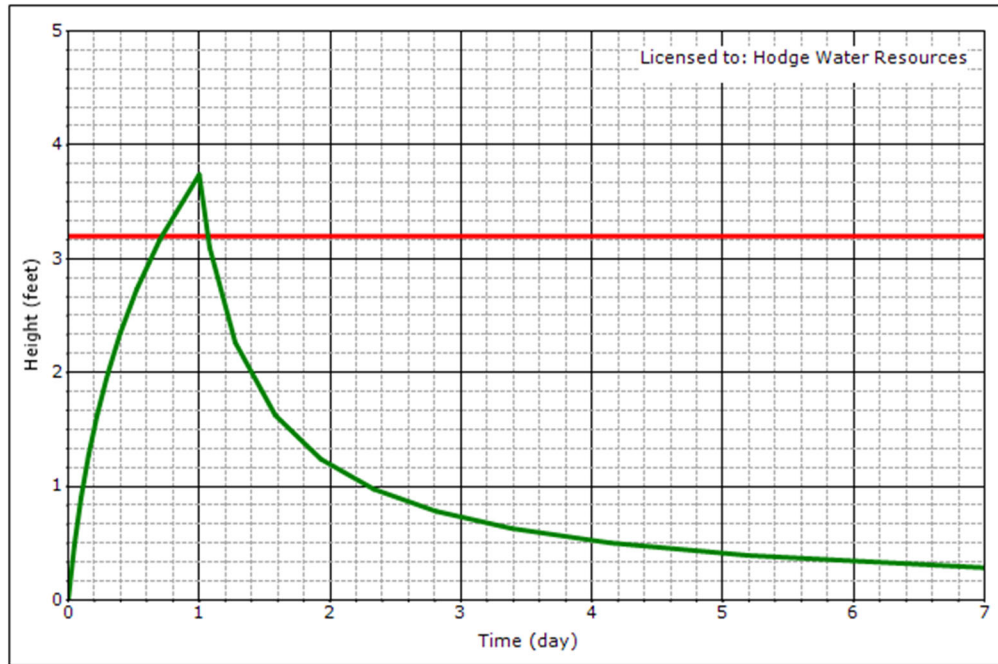
Mound Height versus Distance



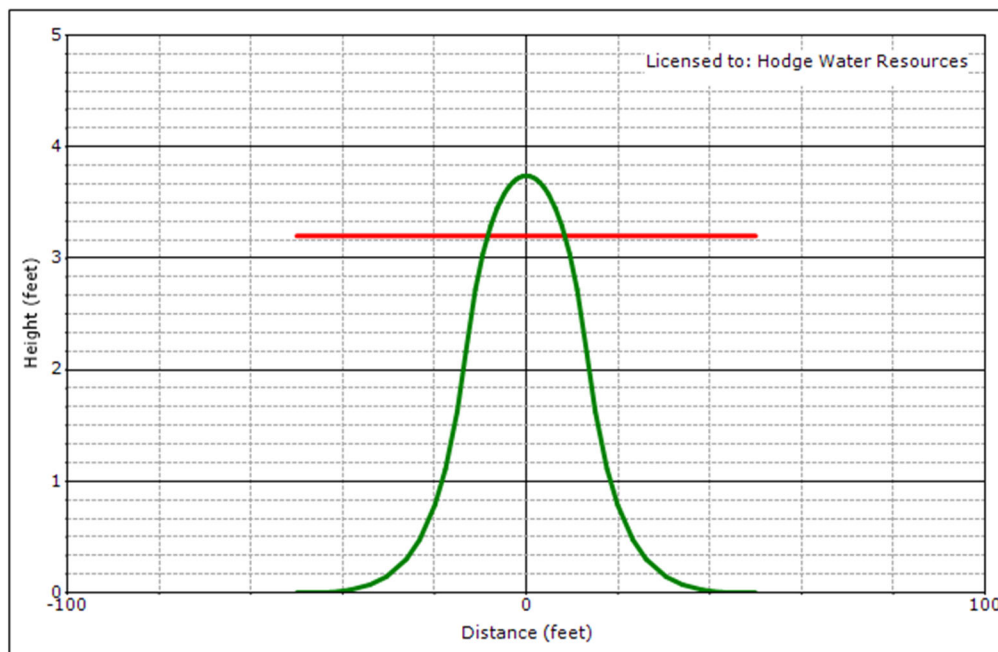
March 15, 2024

Exfiltration System 2,  $K = 5.6 \text{ ft/d}$

Mound Height versus Time



Mound Height versus Distance





## Town of Arlington, Massachusetts

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### DEP #091-0356: Notice of Intent: Thorndike Place (Continuation from 3/21/2024).

#### Summary:

The Conservation Commission will hold a public hearing under the Wetlands Protection Act to consider a Notice of Intent for the construction of Thorndike Place, a multifamily development on Dorothy Road in Arlington.

#### ATTACHMENTS:

Type	File Name	Description
Reference Material	Thorndike_Place_-_SWCA_ISMP_Thorndike_Place_Arlington_MA_3.27.24.pdf	Thorndike Place - SWCA ISMP Thorndike Place Arlington MA 3.27.24
Reference Material	Thorndike_Place_-_SWCA_Peer_Review_Additional_Response_to_Applicant_Comments_Letter.pdf	Thorndike Place - SWCA Peer Review_Additional Response to Applicant Comments Letter





# Thorndike Place Arlington, MA

## Invasive Species Management Plan (ISMP)





# Integrated Pest Management

- ♦ Types of Control Options
  - ♦ Cultural
  - ♦ Biological
  - ♦ Mechanical
  - ♦ Chemical



# Mechanical Control

- ♦ Mulching
- ♦ Brushsaw
- ♦ Chainsaw
- ♦ Hand-pulling
- ♦ Site Specific
- ♦ Hybrid Approach

## Pros:

- Improved access for future control efforts
- No Herbicides

## Cons:

- Increased Disturbance
- Access Dependent
- Repeated Visits Necessary
- Not a long-term treatment on its own
- Expensive
- Non-discriminate



# Herbicides

- ♦ Upland vs Wetland Formulations
  - ♦ Surfactants
- ♦ Glyphosate (Wetland Approved)
  - ♦ Non-ionic Surfactant
  - ♦ Application Method
  - ♦ LD50
  - ♦ ~40-day half-life
  - ♦ Quickly Binds/No Percolation
  - ♦ Sunlight/Bacteria/Fungi
  - ♦ Shikimate Pathway

## Lethal dose comparison

Substance	LD50 (mg/kg of body weight)
glyphosate	4,900
table salt	3,000
acetaminophen	338
paraquat	100
nicotine	9

# Herbicide Usage Other Industries

## Forestry

2,4-D  
Citric Acid  
Clove oil  
Diquat  
Glyphosate  
Imazapyr  
Triclopyr

## Golf Courses

2,4-D  
Acibenzolar-S-methyl  
Aluminum tris  
Azoxytobin  
Bensulide  
Bifenthrin  
Boscalid  
Carbaryl  
Carfentrazone  
Chlorantraniliprole  
Chloroneb  
Chlorothalonil  
Chlorpyrifos  
Clopyralid  
Clothianidin  
Cyfluthrin  
Dicamba  
Diquat  
Dithiopyr  
Ethephon  
Ethylenebisdithiocarbamate io  
Fenoxaprop-ethyl  
Fludioxonil  
Fluoxastobin  
Fluroxypyr  
Flurprimidol  
Flutolanil  
Glufosinate-ammonium  
Glyphosate  
Halofenozide  
Hydrogen dioxide

Imidacloprid

Indoxacarb  
Iprodione  
Lambda-cyhalothrin  
Mancozeb  
Maneb  
Manganese  
Mecoprop  
Mefenoxam  
Mefluidide  
Mesotrione  
Metconazole  
Mineral oil  
Myclobutanil  
Oxadiazon  
Paclobutrazol  
Pendimethalin  
Pentachloronitrobenzene  
Phosphorous acid  
Polyoxorim  
Propamocarb hydrochloride  
Propiconazole  
Pyraclostrobin  
Quinclorac  
Sethoxydim  
Spinosad  
Sulfentrazone  
Sulfur  
Thiophanate-methyl  
Thiophanate-Methyl, Dimet  
Triadimefon  
Trichlorfon  
Triclopyr  
Trifloxystrobin  
Trinexapac-ethyl  
Vinclozolin  
Zinc

## Lawn Care & Ornamentals

2,4-D  
2,4-DP  
Abamectin  
Acephate  
Allethrin  
Azoxytobin  
Bacillus popilliae  
Bacillus subtilis  
Bacillus thuringiensis subsp. Kurstaki  
Benefin  
Bifenazate  
Bifenthrin  
Calcium Hypochlorite  
Captan  
Carbaryl  
Carbendazim  
Carfentrazone  
Charcoal  
Chlorantraniliprole  
Chlorfenapyr  
Chloroneb  
Chlorothalonil  
Clopyralid  
Clothianidin  
Copper Hydroxide  
Copper Oxychloride  
Copper Sulfate  
Cyfluthrin  
Debacarb  
Deltamethrin  
Dicamba  
Dichlorprop  
Dicrotonhos (Ridrin)

Diquat  
Dithiopyr  
Ethephon  
Fenarimol  
Fenoxaprop-ethyl  
Ferrous sulfate monohydrate  
Fludioxonil  
Fluroxypyr  
Glyphosate  
Halosulfuron-methyl  
Imazapic  
Imidacloprid  
Iprodione  
Iron phosphate  
Isoxaben  
Lambda-cyhalothrin  
Lithium Hypochlorite  
Malathion  
Mancozeb  
MCPA  
Mecoprop  
Mefenoxam  
Mefluidide  
Mesotrione  
Mineral oil  
Monosodium methanearsonate  
Myclobutanil  
Oxytetracycline Calcium Complex  
Paclobutrazol  
Pendimethalin  
Penoxsulam

Phosphorous acid  
Piperonyl butoxide  
Potassium salts of fatty acids  
Prallethrin  
Prodiamine  
Prometon  
Propiconazole  
Pyrethrins  
Pyriproxyfen  
Quinclorac  
Siduron  
Sodium nitrate  
Spinosad  
Spiromesifen  
Sulfentrazone  
Sulfur  
Tau-fluvalinate  
Tebuconazole  
Thiabendazole Hypophosphite  
Thiophanate-methyl  
Triadimefon  
Trichlorfon  
Triclopyr  
Trifluralin  
Triforine  
Trinexapac-ethyl  
Zinc ion and manganese ethylenebisdithiocarbamate



# Chemical Application Methods

## ♦ Foliar

### ♦ High-Volume

- ♦ Hydrosprayer
- ♦ Mistblowers

### ♦ Moderate Volume

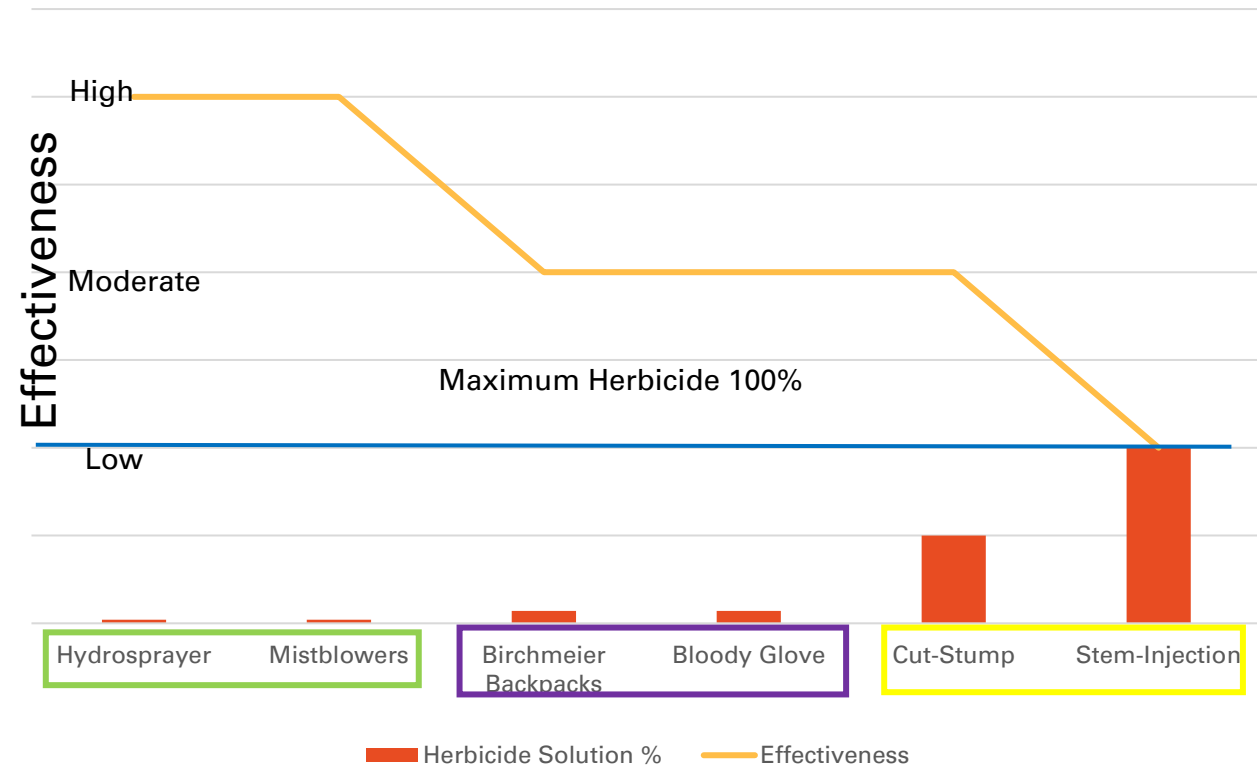
- ♦ Birchmeier Backpacks
- ♦ Bloody-Glove

## ♦ Cut-Stump

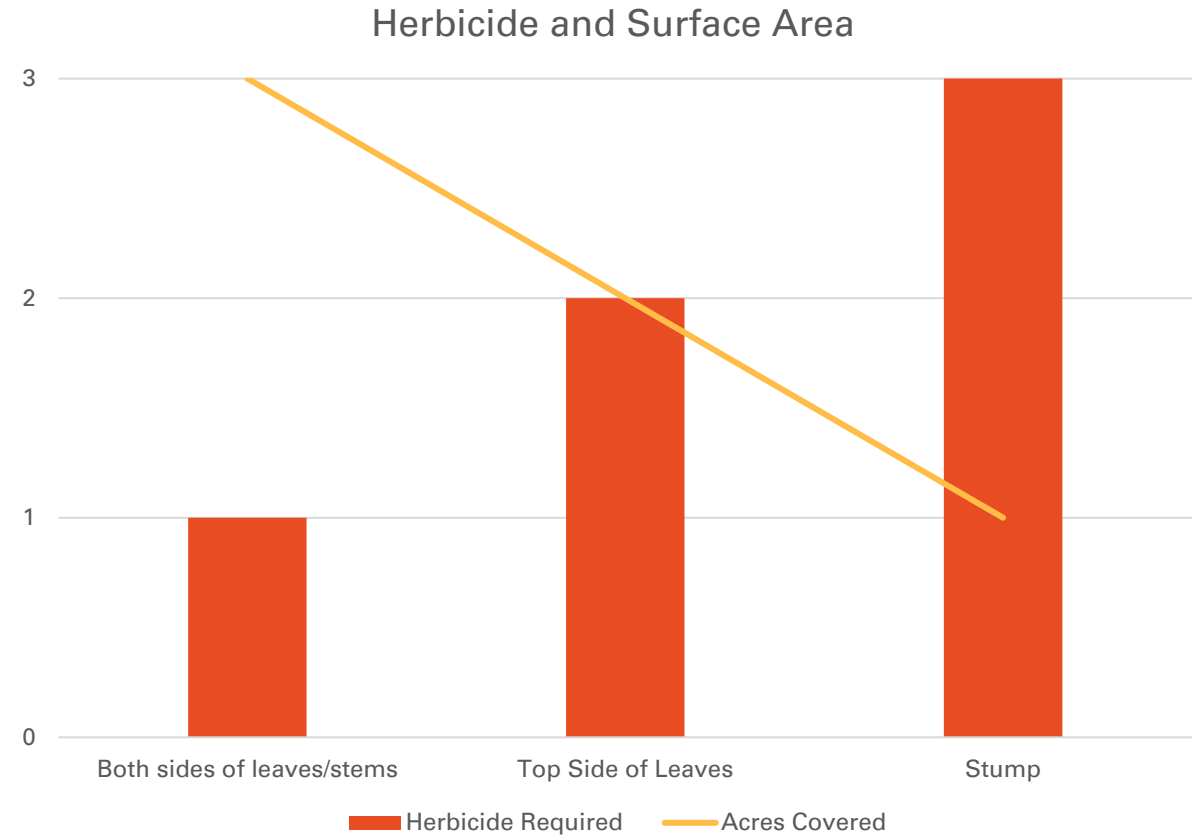
### ♦ Low Volume

- ♦ Buckthorn Blaster
- ♦ Stem-Injection

Herbicide Solution % Vs. Effectiveness



# Surface Area and Herbicide Usage



# Chemical Use Examples

- ♦ Pros:
  - ♦ Relatively Inexpensive
  - ♦ Low Impact/Low Disturbance
  - ♦ Preserves Native Plant Populations
  - ♦ 1 Treatment Per Year
  - ♦ Effective
  - ♦ 90% - 95% Control in 3 – 5 years



# The Hybrid Approach

- ♦ Chemical Control – Mechanical Control – Chemical Control
  - ♦ Japanese knotweed pre-mechanical treatment
  - ♦ Mechanical control assisting in seed flushes
  - ♦ Chemical control post mechanical control may reduce overall herbicide use
  - ♦ Timing of the schedule of items in this scenario are important

# Thorndike Place Options

- Option 1: Chemical Control

Table 3: Option 1 - Chemical Control

Task Chemical Approach	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1. Garlic Mustard Chemical Treatment												
2. Cut Mature Trees (Norway Maple/Tree-of-Heaven) and Stump Treat												
2a. Create Wildlife Piles												
2b. Retain Logs for Chipping/Weed Suppression												
3. Foliar Treatment on Woody Plants*												
4. Foliar Treatment on Japanese Knotweed												
5. Chip Norway/Tree of Heaven logs for 3" mulch after GM treatment												
6. Monitoring/Follow-up Treatment												
7. Monitoring												
Season 1												
Season 2												
Season 3												
Seasons 4, 6, 8, & 10												



# Thorndike Place Options

- Option 2: Chemical – Mechanical  
- Chemical

Table 4: Option 2 – Mechanical Control Option

Task Mechanical Pre-Treatment Approach	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1. Cut Mature Trees (Norway Maple/Tree-of-Heaven) and Stump Treat												
1a. Create Wildlife Piles												
1b. Retain Logs for Chipping/Weed Suppression												
2. Chemical Treatment of Japanese knotweed (Foliar)												
3. Mechanical Mulching Treatment												
4. Site Wide Chemical Control Treatment												
5. Chip Norway/Tree of Heaven logs for 3" mulch after GM treatment												
6. Monitoring												
Season 1												
Season 2												
Season 3												
Seasons 4, 6, 8, & 10												



# Questions/Comments

March 27, 2024

Ryan Clapp  
Arlington Conservation Commission  
730 Massachusetts Avenue Annex  
Arlington, MA 02476

**Re: Notice of Intent Restoration Plan Peer Review – Review of Response to Comments  
Thorndike Place, Arlington, Massachusetts**

Dear Mr. Clapp and Members of the Commission:

SWCA Environmental Consultants (SWCA) submitted a peer review letter report dated January 23, 2024 for a proposed restoration plan as part of the proposed Thorndike Place Residential Community Notice of Intent (NOI). In response to that report, BSC Group, Inc. (BSC), submitted a response to comments letter dated February 7, 2024, including revised plan materials. SWCA completed a review of those responses revised NOI documents on March 6, 2024. BSC submitted additional revised materials for review on March 7, 2024 (Invasive Species Management Plan [ISMP]) and March 12, 2024 (Response to Comments response and revised restoration plans). This correspondence represents SWCA's review of those revised materials.

## **PROJECT NARRATIVE**

### **Project Activities & Associated Impacts**

SWCA Comment 1: Section 3.1.1, second paragraph. The narrative states that dead trees (i.e., snags) that do not provide wildlife habitat will be cut and stumped. Snags provide a wide variety of valuable wildlife habitat functions including shelter and forage opportunities. It is doubtful there are any snags that do not provide any wildlife habitat functions. Additionally, removal of snags does not appear to provide any ecological benefit and stumping of snags within the restoration area would likely result in unnecessary additional impacts (e.g., soil disturbance).

SWCA recommends that this language be revised to indicate that only snags that pose a hazard (e.g., leaning towards the proposed buildings and likely to result in property damage or injury) be removed and that no stumping will occur. SWCA recommends the Commission also consider a condition in the Order of Conditions (OOC), if issued, stating that any snags to be removed shall be approved by the Commission.

BSC Response 1: BSC concurs with the recommended revision and suggests a Special Condition allowing removal of snags from the proposed restoration area that pose a hazard (e.g., leaning toward buildings and/or likely to result in property damage or personal injury) and that no stumping of removed snags shall be permitted. We additionally recommend that the Special Condition allow for a

representative of the Commission be authorized to coordinate, review, and approve any snag removal on behalf of the Commission to avoid construction delays.

**SWCA Response 1: SWCA agrees with this response and approach. No further response required.**

SWCA Comment 2: Section 3.1.1, second paragraph. The narrative states that an Invasive Species Management Plan (ISMP) for work within resource areas and their buffer zones shall be developed as required by the Comprehensive Permit. During the site walk on January 5, representatives from BSC indicated that invasive species control would be included as part of the proposed restoration efforts. It is unclear how invasive species would be controlled (e.g., mechanical removal, chemical control, etc.) or what the target species would be.

SWCA recommends the Applicant develop a detailed ISMP to be included as part of the NOI that details what the target invasive species will be, proposed specific control methodologies, a monitoring plan to measure invasive vegetation control success, and performance goals. SWCA recommends the ISMP be reviewed by an expert in invasive species removal as some species (e.g., Japanese knotweed [*Reynoutria japonica*]) can be extremely challenging to effectively control.

BSC Response 2: Several invasive plant species occur on the site, most notably Japanese knotweed, oriental bittersweet (*Celastrus orbiculatus*), and garlic mustard (*Alliaria petiolata*). These occur within jurisdictional resource areas and buffer zones, as well as within non-jurisdictional areas of the site.

BSC and the Applicant will prepare an Invasive Species Management Plan (ISMP) to treat invasive plants currently within the proposed wetland restoration area and to control their spread within the restoration area. BSC recommends that approval of such ISMP by the Commission's representative prior to the start of work be made a Special Condition of an OOC for the project.

SWCA Response 2-1: SWCA recommends that the ISMP be submitted to the Commission and reviewed by an expert in the control of invasive species prior to the issuance of an OOC. Effective control of invasive plants is critical to the success of any ISMP and may require complex management methodologies given the extent and diversity of invasive species on the site. Review of the ISMP prior to OOC issuance ensures the ISMP will be effective and that the Commission has the ability to guarantee that the plan is adequate prior to permit issuance.

BSC Response 2-1: BSC submitted a proposed ISMP for peer review on March 7, 2024.

SWCA Response 2-2: *In SWCA's experience, the most effective way to manage sites similar to the proposed project is to utilize an adaptive management approach. The mechanical, manual, and chemical options appear to be presented as if only one can be chosen for each species. For example, common reed (*Phragmites australis*) and Japanese knotweed, benefit from a combined approach (e.g., cutting first at the appropriate time and then treating with herbicide at the appropriate time. There also appears to be consistent issue throughout the ISMP of misrepresenting the proposed concentrations of herbicide and not mentioning that the chose herbicide label must be followed.*

*SWCA recommends the ISMP be adaptive and that sticking to a strict pre-set and unchangeable schedule from year to year is not in the best interest of achieving effective invasive management. However, the first year's schedule should be specifically laid out. Depending on when construction is expected to commence (e.g., clearing, grading, etc.) the method of moving forward with treating invasive vegetation may need to be revised. If the exact start date of construction is unknown, the ISMP should be reframed that stresses the qualified invasive applicator/specialist can decide what treatment method and*

timing should be utilized based on site conditions. SWCA also recommends the Applicant either check the label and edit the percentages of herbicide or revise the ISMP to specify that the label rates will be followed.

**SWCA Comment 3:** Section 3.1.1. The narrative includes multiple references to refuse that has been dumped on the site over the years. During the site walk on January 5, it was noted that as part of the proposed restoration work, the refuse would be removed as much as practicable.

SWCA recommends the Commission include a condition in the OOC, if issued, that requires all surficial refuse, including discarded clothing, metal, concrete rubble, lumber, plastic, and other similar garbage, to be removed from within the resource areas and their associated buffer zones within the limit of work. SWCA also recommends the Commission indicate that any refuse at the surface and partially buried be removed to a depth of up to 12 inches below ground (e.g., a shopping cart that has become partially buried in the soil).

**BSC Response 3:** BSC concurs with SWCA Comment 3 and agrees such a Condition be included as part of the OOC.

**SWCA Response 3: No further response required.**

**SWCA Comment 4:** Section 3.1.1. The narrative provides a brief discussion of the proposed restoration activities, specifically restoration plantings. However, successful habitat restorations consider a wide variety of considerations, beyond vegetation. More specifically, the wildlife habitat and vegetation evaluation provided in Attachment G of the NOI identifies numerous wildlife habitat features including large woody debris, snags, hard mast and berry producing forage, rocks and rock piles, and others.

SWCA recommends the restoration plan consider how to improve important wildlife habitat functions within the restoration area and include methods to provide important wildlife habitat features that may be lost due to proposed impacts elsewhere on site.

**BSC Response 4:** The Restoration Plan has been updated to include proposed placement of coarse woody debris and stones and a few stone piles using natural materials originating from within the limit of work on the project site. The Restoration Plan maximizes the use of native berry and mast producing vegetation to benefit wildlife habitat values of the restoration area. See Appendix for details of wildlife habitat features.

**SWCA Response 4: SWCA concurs with these revisions. No further response required.**

**SWCA Comment 5:** Section 3.1.1. The narrative and the wildlife habitat and vegetation evaluation identify numerous native and non-native trees and shrubs within the project limit of work, including the restoration area. However, out of the 17 proposed trees and shrubs to be planted, only two (red maple [*Acer rubrum*] and American hornbeam [*Carpinus carolineana*]) are included on the plant schedule.

SWCA recommends the restoration plan be revised to include species within the restoration area that occur on-site to better represent the diversity and community structure of adjacent habitats. There are numerous trees and shrubs documented in the NOI application materials that would be suitable for the restoration area including American elm (*Ulmus americana*), black cherry (*Prunus serotina*), yellow birch (*Betula allegheniensis*), sweet birch (*Betula lenta*), box elder (*Acer negundo*), silver maple (*Acer saccharinum*), white pine (*Pinus strobus*), sycamore (*Platanus occidentalis*), black willow (*Salix nigra*), and others that are also typically readily available as nursery stock.



**BSC Response 5:** BSC concurs with SWCA Comment 5 and has updated the proposed planting plan and shown approximate locations of wildlife habitats.

**SWCA Response 5-1:** The proposed planting plan still includes multiple species that are not representative of the of the diversity and community structure of the adjacent habitats (e.g., Atlantic white cypress [*Chamaecyparis thyoides*] and others). SWCA recommends the planting plan be revised to includes species that better represent the adjacent communities within the restoration area.

**BSC Response 5-1:** Please refer to Sheet L-100. No tree is proposed within the restoration area or compensatory flood storage area that is not specifically listed in SWCA Comment 5. BSC is providing a color-markup of the restoration planting sheet to clarify proposed species placements.

It should be noted that the planting plan is for the entire project site, including areas outside of the Commission’s jurisdiction.

The proposed woodland and floodplain restoration seed mixes are as follows:

Botanical Name	Common Name
<i>Asclepias syriaca</i>	Common milkweed
<i>Asclepias incarnata</i>	Swamp butterfly weed
<i>Symphyotrichum novae-angliae</i>	New England aster
<i>Chamaecrista fasciculata</i>	Partridge pea
<i>Elymus canadensis</i>	Canada wild rye
<i>Elymus virginicus</i>	Virginia wild rye
<i>Festuca rubra</i>	Red fescue
<i>Redbeckia laciniata</i>	Green-headed coneflower
<i>Schizachyrium scoparium</i>	Little bluestem
<i>Solidago juncea</i>	Early goldenrod
<i>Sorghastrum nutans</i>	Indian grass
<i>Symphyotrichum novi-belgii</i>	New York aster
<i>Baptisia tinctoria</i>	Horseflyweed
<i>Desmodium canadense</i>	Show tick-trefoil
<i>Euthamia graminifolia</i>	Flat-top goldenrod
<i>Pycnanthemum virginianum</i>	Virginia mountain mint

**SWCA Response 5-2:** SWCA concurs with these revisions. No further response required.

## SITE PLANS

**SWCA Comment 6:** Sheet G-101, Planting Notes, Note 11. The site plans indicate that the plant species indicated on the plant list are recommendations only and that final selection of the species shall occur at the time of plant purchase, depending on availability and that the size and quantity shall not change without approval of the Applicant’s landscape architect.

SWCA recommends this note be revised to indicate that the proposed planting species, sizes, and quantities may be subject to change based on availability. However, these changes should be approved by the Conservation Commission and should be approved prior to purchase.

**BSC Response 6:** BSC has made the recommended revision to the Sheet G-101 Planting Notes, Note 11. We recommend that the OCC allow administrative approval of such availability-based changes by the Conservation Commission or its authorized representative to prevent undue construction delays in making such substitutions if necessary.

**SWCA Response 6: SWCA agrees with these revisions. No further response required.**

**SWCA Comment 7:** Sheet G-101, Comprehensive Permit Notes, Comment I.5. This comment notes that dumping of woody vegetation, brush, and other debris in a resource area or its associated buffer zone is prohibited.

SWCA notes that an exception to this requirement might be considered for the restoration area as large woody debris, brush piles, and other similar wildlife habitat features provide quality habitat functions and are likely to increase the ecological value of the restored habitats.

**BSC Response 7:** Sheet G-101, Comprehensive Permit Notes, Comment 1.5 is a Condition of the Comprehensive Permit, and the wording is copied directly from that Condition. The intent of the Condition is to prohibit the dumping of materials removed during construction in the wetlands or buffer zone. In accordance with BSC Response 4 above, the Restoration Plan will be updated with detailed natural coarse woody debris and stone wildlife habitat features using materials originating from the site, but material removed from the site during construction will not be disposed of within resource areas or associated buffer zones in accordance with the Comprehensive Permit condition.

**SWCA Response 7: SWCA agrees with this approach. No further response required.**

**SWCA Comment 8:** Sheet G-101, Comprehensive Permit Notes, Comment I.25. The site plans note that the survival rate of planted species shall be 80% at the end of the third year and that a corrective action plan must be submitted if the survival rate is less than 80% at the end of the third year.

SWCA recommends the Commission consider requiring a corrective action plan to be developed by the Applicant if the 80% success rate is not met after any year of monitoring. Waiting until the third year of monitoring to develop and implement any corrective actions may unnecessarily prolong reaching the project's performance goals and may result in unnecessary disturbance to the area to rectify any adverse conditions since the restoration area will have had three years to establish.

**BSC Response 8:** Sheet G-101, Comprehensive Permit Notes, Comment I.25 is a condition of the Comprehensive Permit, and the wording is copied directly from that Condition. The Comprehensive Permit Condition was prepared upon the recommended conditions submitted to the Zoning Board by the Conservation Commission by letter dated October 14, 2021.

**SWCA Response 8: No further response required.**

**SWCA Comment 9:** Sheet L-100, Plant Schedule. The plant schedule includes a number of proposed cultivars within the 100-foot Buffer Zone (e.g., *Clethra alnifolia* 'ruby spice', *Hydrangea quercifolia* 'ruby slippers', and *Hydrangea arborescens* 'annabelle'). In accordance with condition I.24 of the Comprehensive Permit, all mitigation plantings and plantings within all resource areas shall be native, non-cultivar species. Additionally, other cultivars are proposed in other areas of the site along side non cultivars of native species (e.g., pin oak [*Quercus palustris*] and green pillar pin oak [*Q. palustris* 'pringreen'])).

SWCA recommends the planting plan be revised to not include any cultivars.

BSC Response 9: BSC concurs with SWCA Comment 9 and has revised the planting plan to not include cultivars within the 100-foot buffer.

SWCA Response 9-1: The revised planting plan continues to propose a number of cultivars within the 100-foot Buffer Zone. Other cultivars are still proposed in other areas of the site.

SWCA recommends the planting plan be revised to not include any cultivars. SWCA also encourages the Applicant to utilize non-cultivars of native species throughout the site.

BSC Response 9-1: BSC has revised the proposed restoration planting plan to remove cultivars and has revised the proposed seed mixes for the restoration and compensatory flood storage areas to contain only native plants. The lawn seed mix has also been revised to contain only native species.

It should be noted that the planting plan is for the entire project site, including areas outside of the Commission's jurisdiction. There is one plant proposed that is a non-native landscaping plant, but it is proposed to be located along the walking path between the buildings, outside of the Commission's jurisdiction.

**SWCA Response 9-2: SWCA concurs with these revisions. No further response required.**

SWCA Comment 10: Sheet L-100. A note on the plans indicates that all dead trees (i.e., snags) that do not provide wildlife habitat per the landscape architect and wildlife ecologist should be removed. Snags provide a wide variety of valuable habitat functions for wildlife including forage for insects, perches to hunt from, shelter if there are cavities or cracks, and other functions.

SWCA recommends this note be revised to indicate that only snags that pose a hazard (e.g., may fall and land on the buildings) may be removed and that removal of any snags must be approved by the Commission.

BSC Response 10: BSC concurs with SWCA Comment 10 and has revised Sheet L-100 according to SWCA's Comments 1 and 10.

SWCA Response 10-1: This note does not appear to indicate that removal of any snags must be approved by the Commission.

SWCA recommends revising this note as to indicate that Commission approval is required for snag removal.

BSC Response 10-1: The note on Sheets L-100 has been updated to state, "2. Remove all invasive species according to ISMP; cut and remove (do not stump) all dead trees that pose a safety hazard to people or property as determined by Landscape Architect (LA) & Wildlife Ecologist (WE) with administrative approval of Conservation Commission; restore areas with native tree, shrub, and grass plantings as directed by LA. Utilize cut plant materials to construct snags and wildlife habitats as directed by LA & WE.

**SWCA Response 10-2: SWCA concurs with these revisions. No further response required.**

If you have any questions or comments, please do not hesitate to contact me at either (508) 232-6668 or [chase.bernier@swca.com](mailto:chase.bernier@swca.com).

Sincerely,



P. Chase Bernier, CWB, PWS, CERP  
Senior Natural Resources Team Lead

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